AMERICAN ANTIQUITY

E
51
A49

VOLUME XIII

NUMBER 4—PART 1

APRIL 1948

PUBLISHED BY THE SOCIETY
FOR AMERICAN ARCHAEOLOGY

THE SOCIETY FOR AMERICAN ARCHAEOLOGY

OFFICERS

President: FREDERICK JOHNSON, Robert S. Peabody Foundation, Andover, Massachusetts.

First Vice-President: EARL H. MORRIS, Carnegie Institution, P. O. Box 500, Boulder, Colorado.

Second Vice-President: ISABEL KELLY, Guadalajara, Jalisco, Mexico.

Secretary: WALDO R. WEDEL, U. S. National Museum, Washington 25, D. C.

Treasurer: GLENN A. BLACK, Angel Mounds, R. R. No. 2, Newburgh, Indiana.

Editor: IRVING ROUSE, Peabody Museum, Yale University, New Haven, Connecticut.

Associate Editor: JAMES B. GRIFFIN, Museum of Anthropology, University Museums Building, Ann Arbor, Michigan.

Assistant Editors: FREDERICA DE LAGUNA, Arctic; ROBERT F. HEIZER, Pacific Coast; PAUL REITER, the Southwest; WALDO R. WEDEL, the Plains; RICHARD G. MORGAN, the Northern Mississippi Valley; WILLIAM A. RITCHIE, the Northeast; WILLIAM G. HAAG, the Southeast; GORDON F. EKHOLM, Middle America; GORDON R. WILLEY, South America; FRANK H. H. ROBERTS, JR., Early Man.

Members of the Executive Committee: The President, First Vice-President, Second Vice-President, Secretary, Treasurer, Editor, ELI LILLY and CHARLES R. KEYES to 1948, GORDON F. EKHOLM and E. W. GIFFORD to 1949, JOHN L. CHAMPE and ROBERT F. HEIZER to 1950, PHILIP PHILLIPS and GORDON R. WILLEY to 1951.

AMERICAN ANTIQUITY is printed by the George Banta Publishing Company, 450–454 Ahnaip Street, Menasha, Wisconsin, U.S.A.

Published by the SOCIETY FOR AMERICAN ARCHAEOLOGY, during the months of January, April, July, and October. Subscription by membership; annual dues of $6.00 includes quarterly issues of AMERICAN ANTIQUITY and other releases, as issued.

Entered as second-class matter July 22, 1935, at the post office at Menasha, Wisconsin, under the Act of March 3, 1879.

Proposed articles and contributions to "Facts and Comments" should be submitted to the Editor, Irving Rouse; publications for review, reviews, and material for "Notes and News," to the Associate Editor, James B. Griffin.

Subscriptions and orders for back numbers should be addressed to the Treasurer, Glenn A. Black.

Please address all requests for information to the Secretary, Waldo R. Wedel.

AMERICAN ANTIQUITY

VOL. XIII APRIL, 1948 No. 4

A PROGRESS REPORT ON THE DATING OF ARCHAEOLOGICAL SITES BY MEANS OF RADIOACTIVE ELEMENTS

ROBERT S. MERRILL

I. INTRODUCTION

THE importance of being able to date accurately the remains of past societies has long been recognized by archaeologists. The problem has always been to find methods that work in the absence of historical records. Recent developments, such as tree-ring dating, have been great contributions, but they are not applicable everywhere. There is still a great need for new methods to supplement and extend the range of present dating procedures.

A large field of knowledge so far largely unexplored for possible dating methods is the physics and chemistry of archaeological remains. One area in this field is the study of naturally occurring radioactive elements. Some of these elements have been used by geologists to date ancient rock strata, but applications to archaeological materials have not been made. Recently, however, two possible methods for using radioactive elements to date archaeological remains have been proposed on theoretical grounds. It is not yet definitely known whether they will work, or how well. Further research is necessary.

The planning and execution of a research program designed to develop these methods, potentially of great importance to the archaeologist, requires the coordination of the chemist's and physicist's knowledge with the archaeologist's knowledge of field conditions. The object of this report is to provide a basis for the required coordination. It seeks to achieve this objective by presenting, for the archaeologist, first, an outline of the general principles upon which chemical or physical dating methods can be based; and, second, an analysis of the two proposed methods: their theoretical basis, the problems that must be solved to make them useful, and an estimate of their probable range of applicability. Such information should enable the archaeologist to understand how the methods are supposed to work, and to estimate the importance of developing them.

II. THE GENERAL NATURE OF PHYSICO-CHEMICAL DATING METHODS

Physical or chemical dating methods can be based upon the study of materials in which changes in some measurable property go on through time. Such changes can be used for dating purposes because, if one knows the value[1] of a measurable property at two different instants in time, and knows the rate of change of that value during the intervening period, then the length of the time interval separating the two instants can be calculated. Let us see how these principles can be applied to dating archaeological sites.

In an archaeological site one finds the artifactual, plant, animal, and human remains of a past society. These remains consist of objects of various materials such as bone, charcoal, stone, plant fibers, fired clay, etc. Each of these objects and its constituent materials has certain measurable characteristics or properties such as percentage composition of various elements and compounds, color, crystalline structure, etc. Now these objects will have been subject to certain influences during the life of the society whose remains they are. Artifactual objects will have been produced from natural materials by processes which will modify some of their characteristics. Plants, animals, and humans will have been killed or have died, death modifying their characteristics. Each such influence and the modification produced is an "event" occurring during the life of the society. If such "events" can be dated, then the time of occupation of the site can be established. The problem is to discover what kinds of

[1] The value of a measurable property is the number obtained when the property is measured.

"events" make possible the type of calculation mentioned in the first paragraph.

One possible kind of situation is as follows. Suppose that the value of a measurable property of a given kind of object or of one of its constituent materials is a constant under natural conditions, i.e., when unmodified by human hands in the case of inorganic materials, and alive in the case of plants or animals. Since the value is a constant, it will be the same for *any* object of the same kind under the same conditions. Now suppose that a particular kind of "event" so modifies such an object that the value of the measurable property starts and continues to change with time in a fashion calculable from knowledge of the altered condition and not influenced by the conditions of preservation to which it is thereafter subjected. Then, if the *present* value of the measurable property can be determined, the "event" can be dated because the three facts required to calculate the time interval from the "event" to the present can be obtained.

Another kind of situation would be where an "event" causes a measurable property of an object or material to take on a certain definite value which then changes continuously with time in a calculable fashion. If the knowledge of the nature of the "event" which can be obtained from examination of the object and its context enables one to determine the definite initial value of the property which the "event" produced, and other conditions are similar to the first instance, then the "event" may be dated.

These two general cases indicate the types of situations which would make it possible to date archaeological remains. The discussion also serves to point out the kinds of information about measurable properties of objects, effects of "events," and conditions of preservation necessary to determine whether any particular combination of these factors is suitable as a dating method.

With this background, we turn to an analysis of the two proposed dating methods based on the use of radioactive elements.

III. USING RADIOACTIVE CARBON (C14) FOR DATING PURPOSES

The work with radioactive carbon (carbon 14) at the University of Chicago has been done by Dr. W. F. Libby. I have talked with him and made a study of the literature on the topic as a basis for this presentation.

The proposal to use C14 for dating archaeological remains is based on the following considerations.[2] There are theoretical reasons for believing that C14 is created at a constant rate in the atmosphere by the action of a component of cosmic rays on atmospheric nitrogen. Now C14, being radioactive, disintegrates at a rate proportional to its concentration, so its concentration will have built up in the atmosphere until the rate of disintegration of the C14 equals the rate at which it is being produced. This equilibrium concentration will then be maintained. Furthermore, since the carbon in living organisms is directly or indirectly constantly exchanged with atmospheric carbon dioxide, it will be expected to contain the same concentration of C14. Thus, according to this theory, the carbon of all organisms, *while alive*, contains a constant amount of C14; i.e., the number of grams of C14 per gram of carbon of living organisms is a constant.

Now when an animal or plant dies, it ceases to exchange chemicals with its environment, which means it ceases to get any more C14. Then the concentration of C14 in the plant or animal, not being replenished, decreases with time as fast as the radioactive atoms disintegrate. Knowing the original concentration of the C14 and its half-life, it is possible to calculate what the concentration of C14 will be at any time after the death of the organism, provided external influences do not contaminate the body with any extraneous carbon. Then, if the remains of the body are dug up and the C14 content of its carbon determined, one merely has to look at the calculations to tell how much time has passed since the organism died.

This is the theory. It was proposed so recently (1946) that only a relatively small amount of experimental work has been done to verify it. The one series of experiments so far published[3] consisted of analyses of two samples of carbon, one from sewage and one from petroleum. On the theory, the sewage sample should contain C14 since it consists of living organisms and their recent remains while the petroleum carbon, having been isolated a very long time, should contain little or no C14. The experiments verified these inferences and established the concentration of C14 in one sample of "living" carbon. This concentration fell in the range predicted on the basis of the theory.

[2] W. F. Libby, *The Physical Review*, Vol. 69, p. 671, 1946.

[3] E. C. Anderson, *et al.*, "Radiocarbon from Cosmic Radiation," *Science*, Vol. 105, p. 576, 1947.

It remains for future experimental work to discover whether samples of "living" carbon from other sources contain the same amount of C14. One conceivable source of variation in the C14 content of "living" carbon is the possibility that atmospheric mixing may not be sufficient to wipe out the variations in C14 production arising from the change of cosmic ray intensity with latitude. This possibility, though it seems theoretically remote, is being tested at the present time by determining the C14 content of penguins brought from the Antarctic. In addition, it is necessary to check whether the C14 content of "living" carbon has remained constant through past time. Variations with time could arise from two sources: from changes in cosmic ray intensity with time, or from changes in the total amount of "living" carbon on the earth. Since cosmic rays seem to be stellar phenomena, and stellar phenomena change slowly compared to the age of the earth, it is unlikely that appreciable changes in cosmic ray intensity have occurred during the periods of time of interest to the archaeologist. Changes in the total amount of "living" carbon may have occurred if such events as the Pleistocene glaciations caused variations in the total amount of living matter. However, a large fraction of "living" carbon seems to be contained in the oceans, and therefore may have been relatively uninfluenced by the glacial changes. In any event, at present there do not seem to be any direct methods for accurately determining the extent of such changes, so their effects will have to be checked indirectly. This can be done by measuring the C14 content of accurately dated human, plant, or animal remains. Such measurements would also check the validity and accuracy of the method as a whole.

Though the C14 method has not been completely verified as to basic theory, it appears very promising, such modifications as might be necessary appearing not to affect greatly its potential usefulness. Therefore, it seems profitable to examine the technical problems which must be solved before the method (when established) can be extensively used for dating archaeological sites. These problems are of two sorts: (1) the development of the laboratory techniques required to make the measurements sufficiently accurate; and (2) the determination of what kinds of archaeological remains can be used for dating, the amounts required, and how they should be handled. These topics will be discussed in order.

The chief laboratory problem is the measurement of the C14 content of samples of natural carbon. The separation of the carbon from interfering substances presents, so far as I know, no particular difficulties. The measurement of the C14 concentration of pure samples is, however, difficult. The concentration of C14 is so low that the only available assay method seems to be the measurement of the radioactivity of the sample, making use of the proportionality between the concentration of a radioactive element and its rate of disintegration. Moreover, even the radioactivity of natural carbon samples is so small that at present it cannot be measured unless the sample is subject to an isotope enrichment process to increase the concentration of the C14 relative to the non-radioactive isotopes of carbon. This process requires considerable equipment, a relatively large sample of carbon, and is very expensive. There is also the fact that the calculation of the amount of enrichment produced is subject to error. At the present time Dr. Libby and his associates are working on methods of eliminating the uncertainty in determining the amount of enrichment, and are also trying to develop more sensitive techniques for counting the rate of disintegration of C14 in carbon samples. If these latter efforts are completely successful it may be possible to eliminate the isotope enrichment process in analyzing some samples. These developments indicate that considerable improvement in the procedure of measuring C14 may be expected relatively soon.

Another measurement required for the calculation of dates by the C14 method is the value of the half-life of C14. This value has recently (1946) been determined by two independent workers.[4] The two values differ about 6% from their average of 5000 years. Such an error introduces an equal error into any date calculated with its use. Therefore, it is probably desirable to determine the half-life more accurately. This can be done by further repetitions of the assay using any improvements in technique that are possible.

The remaining problems are those of concern to the archaeologist. For what time range is the method likely to be useful? A published estimate gives from 1000 A.D. to about 30,000 B.C.[5] The range depends upon the sensitivity

[4] A. F. Reid, *et al.*, *The Physical Review*, Vol. 70, p. 431, 1946; L. D. Norris, *et al.*, *The Physical Review*, Vol. 70, p. 772, 1946.

[5] E. C. Anderson, *et al.*, *op. cit.*

and accuracy of the C14 measurements and the degree to which the C14 level in "living" carbon is actually constant. Since the latter at least is not yet definitely known, further experimental work is required before a definite answer can be given.

What kinds of archaeological materials can be used? In the exposition of the theory it was noted that the sample must be the remains of a living organism containing carbon, and must not have become contaminated with extraneous carbon. The first condition eliminates fossilized bone from which all the organic compounds have been removed and any other completely decomposed organic material. The second condition is harder to apply and presents a number of problems requiring the cooperation of the chemist and the archaeologist for their solution. The sources of contamination include atmospheric carbon dioxide, carbonates from soil water, and, particularly, the remains of bacteria, fungi, and other organisms which inhabit the soil. Eliminating the effects of the first two requires the choice of remains containing carbon compounds which do not react or exchange with carbon dioxide or carbonates. The third source of contamination may be eliminated by choosing remains some of whose carbon compounds can be chemically and/or physically separated from other organic remains in the site. In general, it would appear *a priori* that if an organic remain can be cleanly separated from its imbedding matrix as an intact object, it can probably be used for dating. However, since such objects would have to be destroyed in the process of C14 analysis and they are usually the most valuable products of archaeological excavation, it is of interest to find out whether any remains usually discarded by the archaeologist might be substituted. (An exception may be bone from which it appears possible to remove the organic constituents leaving the inorganic structure intact.) A likely possibility appears to me to be the use of ashes and other bits of charred organic material containing elementary carbon. Elementary carbon is very stable at ordinary temperatures and I think separable from other material. The problem is whether soil organisms decay to any appreciable extent into elementary carbon which would contaminate such a sample. This may be investigated by analyzing soil samples which do not contain any charred material.

How large a sample is required? Dr. Libby states that one to two pounds of carbon is needed for analysis by present techniques. Future improvements in analytical technique may reduce the quantity considerably for relatively recent sites. If ashes or other such remains of variable carbon content prove to be useful, it would be advisable to develop a simple field technique for determining their carbon content.

How should the samples be handled? Probably no special handling will be required except precautions to avoid contaminating the sample with extraneous carbon. Nothing more can be said until further work has been done to determine exactly the kinds of remains that are usable.

In summary of this discussion, I would say that the C14 method appears very promising and capable of development into a usable method in the near future. Laboratory technical developments and verification of the theory are largely the job of the physicist and chemist. Cooperation of the archaeologist, chemist, and possibly other specialists is required to develop exact criteria for judging the usefulness of various kinds of remains, the amounts required, and methods of handling, as well as to provide usable accurately dated remains for checking the validity and accuracy of the method.

IV. THE RADIUM METHOD

The possibility of using radium for dating archaeological remains was suggested by Dr. H. S. Brown. During the summer of 1947 I worked with him examining the relevant literature and starting a research program. This discussion is the product of my reading and of my talks with Dr. Brown.

The theory of the radium method is similar to that of the C14 method. It is based on the fact that radium from food and water accumulates in the bones of animals (including humans). When an animal dies, this intake ceases and the concentration of the accumulated radium may be expected to decrease with time as the radioactive disintegration of the radium takes place. The amount of decrease could then be used to date the time of death of the animal. The situation differs from that of the C14 method in three particulars. In the first place, the concentration of radium in the bones of an animal just before death is not determined by a radioactive and exchange equilibrium process which makes the concentration constant for all living organisms,

but by the particular way a given kind of organism metabolizes radium. In the second place, radium is produced directly or indirectly by the radioactive disintegration of certain other elements which *may* also be taken in by an animal. Their presence in appreciable quantities would alter the way the concentration of radium changes with time after the death of the animal. Thirdly, there are no stable isotopes of radium as there are of C14, making the finding of constant features in the metabolism of radium and the discovery of usable types of samples more difficult than with C14. I will now discuss the method in more detail, beginning with the problem of determining the pre-death concentration of radium in the bones of animals.

The amount of radium in bone is determined by a number of factors. These include the amount taken in by the animal (which depends in turn on the amount in its food and water), the fraction of the intake that is absorbed from the digestive tract, and the fraction of the absorbed material that is deposited in the bones. Only if these factors are constant or their variations compensate one for another will the total amount of radium in the bones of animals of the same or different species be constant. So far as I know, no experiments with animals or humans in which all these variables have been controlled or measured under conditions of normal intake have been done. Some incomplete (from this standpoint) experiments have been performed on humans where large amounts of radium compared to the normal level were involved.[6] These indicate that the amount of radium absorbed increases with the intake, that the fraction deposited in bone is influenced by the state of calcium metabolism in the organism and the length of time after intake, and that the radium is not deposited uniformly throughout the skeleton. Whether these conclusions apply to normal radium metabolism has not been determined.

In the absence of detailed metabolism studies, measurements of the bones of normal animals or humans would give some idea of how constant is the over-all metabolism of the element. Outside of a few statements as to the order of magnitude of the radium concentration in bone, there appears to be only one extensive study of the required kind.[7] This report suffers from the disadvantage that much of the data was obtained on tissues from miners who mined radium-containing ores and that only a few analyses of bone were made. The data were interpreted as indicating that the radium content of tissues increases with age; however, the values scatter so much that even this relationship would not permit accurate prediction of normal radium levels in any given case. Whether this scatter is due to technical difficulties, the choice of subjects, or is real is not clear.

This general absence of pertinent data can only be remedied by a considerable amount of research. The apparent existence of a correlation between the age of an animal and the normal radium content of its bones makes it appear wise to concentrate first on studying human bones (whose age the physical anthropologist can estimate). A general similarity of the metabolism of radium to that of lead, whose normal bone concentration is known to be variable, indicates that special effort may be required to discover ways of eliminating the effects of metabolic variation. One technique that might be useful would be to measure the concentration of radium in bone not as grams of radium per gram of bone ash, but as grams of radium per gram of barium or strontium in the ash. These two elements, though not isotopes of radium, have chemical properties quite similar to it. Therefore, they might be expected to be influenced by metabolic variations in a similar manner, with the result that the amount of radium relative to the amount of barium or strontium might be more constant than the ratio of radium to total bone ash. Since very little is apparently known about the occurrence of barium and strontium in bone, this refinement would require additional work.

The next problem requiring examination is the way the concentration of radium in bone decreases after the death of the animal. As mentioned earlier, this is influenced not only by the amount of radium, but also by radioactive elements which produce radium directly or indirectly on disintegration. Two elements, uranium and ionium, if present in sufficient amounts, will interfere in this fashion. However, since they produce radium by radioactive

[6] H. S. Martland, *Arch. Path. & Lab. Med.*, Vol. 2, pp. 465–72, 1926. H. Schlundt, and various, *Am. J. Roentgenol. & Rad. Ther.*, Vol. 24, pp. 418–23, 1930; Vol. 26, pp. 265–71, 1931; Vol. 30, pp. 515–22, 1933. Joseph C. Aub, *et al.*, *Annals of Internal Medicine*, Vol. 11, pp. 1443–63, 1938.

[7] A. Krebs., "Der Radiumgehalt menschlichen Gewebes in Abhängigkeit vom Alter," *Zeitschrift für Altersforschung*, Vol. 4, pp. 53–65, 1942.

disintegration, their effects may be corrected for if their pre-death concentrations in bone are known—provided they are not present in such amount as to produce radium as fast as the radium disintegrates. If such a condition of radioactive equilibrium is present in bone, the radium concentration will not change with time and will not be useful for dating. These considerations point up the necessity for determining the normal concentrations of ionium and uranium in bone. However, even less is apparently known about them than about radium, which means that the work is yet to be done.

In addition to these factors, calculating the rate of change of radium concentration with time depends on the assumption that no external physical or chemical changes alter the radium concentration. Therefore, studies of the chemical changes occurring during fossilization of bone are required to determine whether they alter the radium concentration; and, if so, to find out ways of distinguishing unaltered from altered bone. General chemical considerations suggest that measuring the radium concentration in terms of barium or strontium would help avoid some of the possible difficulties. There is a considerable literature on the chemistry of fossilization which is yet to be examined.

Finally, there are the technical laboratory problems of developing the required analytical methods. It appears that many of the difficulties arising from the low concentrations in bone of many of the elements to be studied can be eliminated by new analytical techniques based upon the irradiation of samples with neutrons from a uranium pile.

To summarize, I think it is clear that the development of the radium method is a more complex process beset with more potential difficulties than *appears* to be the case with C14. However, if successfully developed, the method would seem to be of comparable usefulness. It might even allow the dating of sites where the carbon required for the C14 method is not present. While it is not possible now to make a definite estimate, it is probable that the radium method would be useful over a more recent time span than the carbon method.

The first step in the development of the method appears to be an extensive examination of the radioactive and related elements of bone by physicists and chemists. The cooperation of the archaeologist and physical anthropologist seems required chiefly in the study of the nature and effects of fossilization.

V. GENERAL REMARKS

I should like to add to the preceding discussion several remarks designed to put the information about the two methods in broader perspective.

First, I should like to stress the fact that physico-chemical dating methods in general, and radioactive methods in particular, unlike tree-ring dating which depends on the counting of discrete units, are based on measurements subject to experimental error as well as to inadequate theoretical interpretation. As time goes on and scientific knowledge expands, discoveries are usually made which make it possible to reduce these errors. In this sense, such methods never achieve a final form, but are always being improved. This should be kept in mind when evaluating the possibilities of research in the new field.

Second, this report has centered around the two methods using radioactive elements proposed so far. This should not be taken to imply that the two are the only possible methods of their kind. There may be others, though I suspect the number is small. Nor should the conclusion be drawn that no other kinds of physico-chemical dating methods can exist. The report only indicates the present state of my knowledge. A systematic survey of the fields of chemistry and physics would undoubtedly yield a number of suggestions of possible methods worthy of detailed examination. It should be said, however, that those not based on radioactivity will, in general, be subject to the complication that temperature fluctuations are likely to interfere.[8]

Department of Anthropology
University of Chicago
Chicago, Illinois
November, 1947

[8] Readers interested in the technical details of the C14 method are referred to the following report published after this one was prepared: E. C. Anderson, W. F. Libby, *et al.*, *The Physical Review*, Vol. 72, pp. 931–6, 1947.

THE QUANTITATIVE INVESTIGATION OF ABORIGINAL SITES: COMPLETE EXCAVATION WITH PHYSICAL AND ARCHAEOLOGICAL ANALYSIS OF A SINGLE MOUND

A. E. Treganza and S. F. Cook

INTRODUCTION

In a recent paper[1] we explored the possibility of comparing the physical and chemical characteristics of aboriginal sites by the small-sample method. The two mounds investigated showed clear differences with respect to certain features. Whether or not there were quantitative distinctions pertaining to other properties depended upon the validity of the sampling method. It thus became apparent to us that a further investigation should be made wherein the results obtained by sampling could be tested by comparison with data based upon practical certainty. In other words one mound should be sampled and at the same time be completely excavated so as to determine the actual values for the entities under consideration. Concomitantly, an opportunity would be offered to make an archaeological analysis of an aboriginal site in its entirety, including a tabulation of all the cultural elements present, such as artifacts and burials.

We were fortunate in securing for these purposes the mound designated Petersen III. This is the smallest of a series of four village sites located along the upper reaches of Lindsey Slough, a tributary of the Sacramento River, some ten miles northwest of Rio Vista, in the SW ¼ of Sect. 20. T5N, R2E, Solano County, California (Fig. 53). It lies on the property of Mr. Harry E. Petersen, Dixon, California, to whom we are indebted for his very kind and extensive cooperation throughout many weekends.[2]

Suitable sites for such a purpose are rare. The small size and undisturbed condition of the Petersen mound made this investigation possible. In outline, the deposit was roughly circular with a diameter of approximately 35 feet. It lies almost in contact with a much larger habitation site (designated Petersen II), and about one half mile from the site, Petersen I, described in the previous paper (Fig. 53).

PROCEDURE AND METHODS

The site was laid out in a grid pattern of 5-foot squares, or plots, excavation begun systematically in the southwest corner, and carried on plot by plot (Fig. 53). The sterile clay cap was first removed and discarded. The mound material was then shoveled into boxes, each box being weighed immediately on a set of bathroom platform scales. The dirt was then placed in a sieve of ¾-inch mesh and screened. The material not passing the sieve was collected in sacks and taken to Berkeley. There it was washed thoroughly with a garden hose to

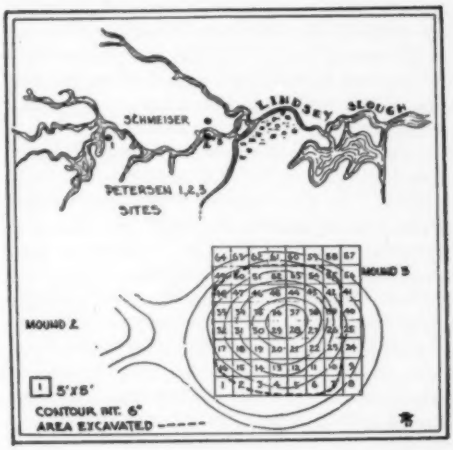


Fig. 53. Map of the upper reaches of Lindsey Slough, Solano County, California, showing the location of Petersen Sites 1–3; plan of Petersen Site 3.

[1] S. F. Cook and A. E. Treganza, "The Quantitative Investigation of Aboriginal Sites: Comparative Physical and Chemical Analysis of Two California Indian Mounds," American Antiquity, Vol. 13, No. 2, pp. 135–41.

[2] We wish to acknowledge with thanks the support of the following persons who contributed many hours of labor: from the University of California, R. Newman, S. Riesenberg, W. King, F. Riddell, C. Alexander, R. Beardsley, C. Smith, Jr., W. Weymouth, J. Nicora, W. Wallace; and from the San Francisco State College, H. Kinsey, J. Creisler, P. Moran, K. Green, and M. Wasbauer. Personal friends helping us were: S. A. Cook, Dr. A. L. Finkle, and Professor R. F. Heizer.

remove adhering dirt and dried. The recognizable pieces of bone, shell, charcoal, and obsidian were removed leaving a mixture of rock and baked clay. Each of these five constituents was then weighed and the total ascertained for each subdivision or plot.

Meanwhile small samples were taken at the site. During the excavation of each plot a random shovelful of mound material was taken from the mixed dirt and placed in a paper bag. Most of these mixed samples were immediately weighed and the gram weight recorded. In addition, columnar samples were removed from the northwest corner of each plot. These were uniformly approximately 4 square inches in cross section and 10 to 20 inches in depth, and were likewise weighed immediately following removal. A total of 113 mixed and columnar samples were thus secured, two to four from each plot, depending upon the depth of the latter. After arrival at the laboratory each sample was dried for one week at 60° C and again weighed, this value being designated the dry weight. The apparent density of the columnar samples could then be determined from the dry weight and the original measured volume. After weighing, the sample was passed successively through a $\frac{3}{8}$-inch sieve and a $\frac{1}{8}$-inch sieve. The fine soil derived from the latter screening was saved for possible chemical analysis. The two residues were then washed, dried, and separated by hand into the five categories mentioned above: rock plus clay, bone, shell, charcoal, and obsidian.

There are derived, therefore, three primary sets of data: (1) for the entire mound, split into 45 parts by plots, total weight, total rock, bone, shell, charcoal, and obsidian, all of size $\frac{3}{8}$-inch or larger; (2) for 113 samples the same items $\frac{3}{8}$-inch or larger; and (3) for 113 samples the same items smaller than $\frac{3}{8}$-inch but larger than $\frac{1}{8}$-inch. These three series have been tabulated by absolute weight and by percentage composition. Since their publication would entail excessive space, the detailed results are not presented here as such. The data are, however, on file for reference.

RESULTS AND DISCUSSION

Weight. The total mass constituting the mound amounted to 59,926 kilograms at the time it was removed. This fresh weight, as it may be termed, is, however, a variable which depends primarily upon the moisture content. The latter function can be determined by the difference between the fresh weight of the samples and their weight after uniform drying. This value in turn depends upon the seasonal and climatic conditions. We excavated 30 plots in the late summer and autumn of 1946 at the end of the dry season and before the first fall rains. The moisture content was very uniform, the mean per cent removable water for 47 samples being 16.71 per cent of the fresh weight with a standard error of ± 0.374 per cent. The remaining 15 plots were excavated beginning in early May, 1947, just after the rainy season. Hence the moisture content was higher. The removable water for 37 samples constituted 21.92 per cent of the fresh weight ± 0.410 per cent.

To determine the dry weight of the entire mound it was necessary to calculate that of each plot separately, using the observed moisture content of the corresponding samples as an index. This method yielded a value of 48,631 kilograms total dry weight. Using this figure with the observed 59,926 kilograms fresh weight the over-all moisture content appears as 18.85 per cent. The latter value, as derived from the mean of all (84) samples is 18.99 per cent. The total dry weight calculated as 100—18.99, or 81.01 per cent is 48,546 kilograms. The first value, 48,631 kilograms, is used in subsequent calculations involving the total weight of the mound.

Volume and density. The volume of a mound, an entity which often assumes importance, can be estimated only indirectly. As a rule habitation sites and midden deposits conform rigidly to no simple geometric pattern. The site under consideration, Petersen III, appeared before excavation to represent quite closely a segment of a sphere, with maximum height in the center and with the periphery very nearly circular. Accordingly the formula for the volume of a spherical segment was applied.[3] This formula states that $V = \frac{1}{6}\pi h(h^2 + 3a^2)$ where h is the height of the segment and a is the radius of the base. Here the maximum height, h, proved to be 36 inches or 0.92 meter, and the average radius of the base 15 feet, or 5.33 meters. The volume would then be 41.45 cubic meters. However, two points were developed during

[3] In other cases the mound might approach simple solids, such as a segment of a cylinder, a pyramid, a cone, or an oblate spheroid, for the volume of which a solution is available. Certain irregular mounds could be broken up into simpler parts, others defy any general treatment. At best all these estimates are only approximations.

excavation. First the sides sloped in a linear, rather than in a curvilinear fashion, from the summit, and secondly the base was not level. Rather it sloped slightly downward from south to north. If we disregard the latter factor and apply the formula for the volume of a cone: $\frac{1}{3}\pi r^2 h$ we get for the mound 27.36 cubic meters. The two results show a clear discrepancy.

Another line of approach is through determinations of density. In this connection we deal only with apparent density, or the ratio of dry weight to volume measured in the ground. For this purpose the columnar samples are appropriate since the volume of each was measured at the time it was removed. We have 68 of these, the mean density of which is 1.625, with a standard error of ± 0.048 or 2.95 per cent of the mean. The volume would be 29.92 cubic meters. Alternatively we may use the density of the individual samples to calculate the volume of each plot separately. The total, by this method is 31.57 cubic meters.

The two density calculations and the geometrical estimate (by the cone formula) are all in fairly close agreement. It would be reasonable to set the final estimate at 30 cubic meters ± 10 per cent.

Archaeologists are occasionally confronted with the problem of estimating the mass of material accumulated at a particular site. Since the actual weighing of the entire accumulation is seldom if ever feasible, resort must be had to the sampling method. From the previous discussion it is clear that a reasonable approximation of the apparent density may be secured by determining the dry weight of samples, the volume of which is carefully measured at the time of removal. The accuracy of the mean density is of course a function of the size of each sample and the sample number. The size is more or less limited by practical considerations. An ordinary paper bag, holding 3 to 5 pounds of soil, represents the maximum convenience. Added poundage is of relatively little theoretical significance and soon becomes burdensome from the standpoint of handling and transport. With respect to sample number, the rule should be borne in mind that the standard error of the mean varies inversely with the square of the sample number. Thus to reduce the standard error by one half, the samples must be four times as numerous. With 68 samples at Petersen III the standard error of the mean was ± 2.95 per cent of the mean. Twenty-four samples taken in the same manner would have yielded a standard error of ± 5 per cent and 6 samples a standard error of ± 10 per cent. The mound substance was relatively homogeneous. Had it contained appreciable quantities of large objects occurring in an erratic fashion such as rocks, bones, artifacts, or charcoal, then the error would have been greater and correspondingly more samples would have been necessary in order to acheive the same level of accuracy. As a rule such disturbing factors can be evaluated in advance and the sampling performed with reference to them.

As to the absolute level of reliability desirable it is probable that a standard error of ± 5 per cent of the mean is sufficiently close. For a homogeneous mound, therefore, 25 samples should be entirely adequate. Even fewer, say 10 to 15, should give a fairly close approximation to the apparent density, but the danger is greater that random inclusion of very heavy or light material would influence the result.

To estimate mass, the density calculated from samples must be multiplied by total volume. The latter can be determined directly only by geometrical methods, the nature of which must depend upon the care and ingenuity of the observer. Assuming reasonably competent workmanship, the volume estimate will be quite close. Hence the total weight of any material accumulation can be determined within limits sufficiently close to be of value for quantitative study.

In addition to over-all mass some information concerning internal variation in density can be secured by the sampling method. For instance, in our type case, Petersen III, there were 21 plots, in the center of the mound, from each of which two or more columnar or vertical samples were taken. Here the upper layer may be compared with the lower. The upper 21 samples showed a density of 1.693 and the lower 1.837. But when the critical ratio between the two levels is calculated it is found to have a value of 1.36. The distinction is therefore without statistical significance, and the interior of the mound is uniform in the vertical direction. If, however, we compare the average density of the 21 interior plots with the 23 peripheral plots we find the value for the former to be 1.802 and for the latter 1.295. The critical ratio of the means is 6.17, denoting a highly significant difference. The periphery is considerably less dense than the center, a fact which may have a bearing on the interpretation of the origin and development of the site.

Rock. Under this term is included not only particles of true rock, but also lumps of baked or burned clay. Indeed in this mound the clay preponderates. However, a separation of the two types of material is almost impossible, particularly in the finer sizes and no serious discrepancy is introduced by treating both together as a single component.

The rock held by the ¾-inch screen was weighed. Its total mass was 6,502 kilograms, or 13.37 per cent of the mound weight. For each sample the same item was determined and the average computed. Its value is 12.66 per cent, or in terms of the measured value 5.25 per cent less. Part of this difference is included in the standard error of the mean of the samples: ±4.60 per cent of the mean. The balance probably lies in variation of rock content throughout the mound. Some clue to the latter factor is obtained by comparing the heavy plots with the lighter ones. Thus those weighing over 1,100 kilograms contained an average of 14.81 per cent rock and those under 1,100 kilograms 8.18 per cent. Treating the data in another fashion, the correlation coefficient of per cent rock against weight of plot for 45 plots is +0.682. Similarly r for per cent rock in each sample against the weight of the plot from which the sample was taken is +0.556. The heavier plots, therefore, appear to show a higher rock content. But the heavier plots are those centrally located in the mound. If we compare the content of the plots by location we find that the mean rock content as found by screening and weighing for the 21 central plots is 15.20 per cent and the corresponding value for the 24 peripheral plots is 8.12 per cent. Since the critical ratio of the means is 10.82 there can be no question that the rock and burned clay tend to be concentrated in the center. This result is wholly in conformity with the fact noted above that the peripheral apparent density is much lower than that of the center and interior.

The relatively low value of the ¾-inch rock content as calculated from the samples is now seen to arise in part from an unconscious bias in the sampling procedure. For we took two samples each from the less dense, peripheral plots (one mixed, one columnar) and no more than four (usually three) from the deeper, heavier central plots. We should have kept constant the ratio of sample number to mass of plot.

Disregarding for other purposes the slight bias just mentioned, the standard error of the mean for 113 samples is ±4.60 per cent of the mean. To get ±5 per cent, 96 samples would have sufficed; for ±10 per cent 24 samples and for ±20 per cent 6 samples. Hence a moderate number (20 to 30) would have given a reasonably close but not extremely accurate approximation to the real value.

The rock particles passed by the ¾- but held by the ¼-inch screen appear to be homogeneously distributed throughout the mound, judging by their appearance in the samples. The mean is 27.62 per cent with a standard error of 1.62 per cent of the mean. An error of ±5 per cent thus could be obtained with 12 and only ±10 per cent with only 3 samples. These are fewer samples than one would ordinarily wish to take to determine other components. Therefore, finely divided rock should seldom constitute a serious problem.[4]

If we sum the percentage of ¾-inch rock for Petersen III as derived from actual measurement and that of ¼-inch rock as determined by samples, we get 40.98 per cent, or 19,929 kilograms. Using the value for ¾-inch rock as derived from the samples the result is 40.28 per cent or 19,589 kilograms.

Bone. The occurrence of bone in habitation sites resembles in some respects that of rock, particularly in that the material appears partially in large masses, such as whole, intact bones, and partially as rather finely broken-up fragments. The ¾-inch screen catches all the former and the ¼-inch screen most of the latter.

In Petersen III the total mass of bone held by the ¾-inch screen amounted to 23,850.5 grams, or 0.0490 per cent of the total dry weight of the mound. The same quantities as computed from 113 samples were 27,379 grams and 0.0563 per cent, respectively. The sampling method yielded a higher figure but this is accounted for by the standard error of the mean of the samples, which was ±13.85 per cent of the mean. There is no detectable systematic variation of this component within the mound. In order to refine the estimate of large bone fragments a much larger sample series would have been necessary. Thus the 10 per cent level (i.e., a standard error of ±10 per cent) would have required 217 and the 5 per cent level 869 samples, numbers which are ordinarily out of

[4] The same principle applies to any constituent known in advance to occur in a finely divided condition and in relatively large quantities. For instance, in the San Francisco Bay mounds where finely comminuted shell may comprise nearly half the mound mass, very few samples would be needed to establish the exact proportion by weight.

the question. A comparable effect might perhaps be obtained by increasing the size of each sample, so as to secure a greater body of mound material and improve the chances for inclusion of entire bones. On the hypothesis that a large sample could theoretically be split in two or more smaller ones, and using our mean sample size of 1.68 kilograms dry weight, the 10 per cent level of error could be reached with 113 samples with average weight 3.22 kilograms and the 5 per cent level with an average weight of 12.88 kilograms. This would mean an aggregate of 1,455 kilograms, or 2,840 pounds of mound matrix. It would perhaps be feasible if an exact estimate of large bone is deemed essential to take a relatively few very heavy samples, say of 500 to 1,000 pounds; determine the bone content; and then take samples of the samples in order to estimate density, total weight, and volume. Naturally further error would be introduced by the second order of sampling but by proper procedure this might be kept within reasonable limits.

Some such device appears inevitable for the study of the occurrence and density of similar sizeable objects such as artifacts. The method might even be extended to include such very large components as burials, ash lenses, housepits, and the like.

The bone held by the $\frac{1}{8}$-inch screen shows a mean of 0.1902 per cent by weight with a standard error of 2.92 per cent of the mean. As with rock, finely divided bone appears to be quite evenly distributed through the mound and is defined within very close limits with the 113 samples taken. The 5 per cent level of error would have been attained with 66 samples and the 10 per cent level with 16.

The total bone in the mound, on the basis of these mean estimates, amounts to 0.2392 per cent, or 116,325 grams.

Shell. This component is definitely present but in extremely small quantities. The shell held by the $\frac{3}{8}$-inch screen during the sifting of the entire site weighed 511.112 grams, or 0.00105 per cent of the dry weight of the mound. The mean of the samples was 0.00147 per cent, a difference substantially accounted for in the standard error of the samples: 21.36 per cent of the mean. The fine shell, that held by the $\frac{1}{8}$-inch screen, amounted to 0.00620 per cent by weight with a standard error of 9.41 per cent of the mean.

The limit of accuracy in determining shell is clearly much wider than for bone. In order to achieve a standard error of ± 5 per cent of the mean, 2,063 samples would have been needed for the coarse and 400 for the fine shell. On the other hand it is doubtful whether extreme precision is mandatory. If the total were estimated to within an error of ± 40 per cent, as it could be with 52 samples for coarse and 13 samples for fine shell, the general order of shell content would be reasonably well defined. Using the mean values as found in the actual sample series the weight of shell in the mound represents 3,525.75 grams, or 0.00725 per cent. Allowing a tolerance of ± 40 per cent the limits lie between 4,936 and 2,115 grams, or between 0.01015 and 0.00435 per cent, a negligible difference from either the cultural or the nutritional points of view.[5]

Charcoal. This material occurs both as discrete pieces which can be recovered by screening and as finely subdivided powder scattered throughout the mound matrix. The former can be treated by physical analysis; the latter requires chemical techniques such as combustion. Since the chemical method includes all charcoal, regardless of state of aggregation, it is, theoretically at least, preferable to any other procedure for the determination of inorganic carbon. Nevertheless in order to estimate charcoal, the organic carbon in the sample must be excluded. This in turn involves difficulties in analytical procedure. Hence it might be desirable on occasion to employ the simple segregation of charcoal fragments. On the other hand this method also is subject to certain criticisms.

The charcoal held by the $\frac{3}{8}$-inch screen weighed 1105.32 grams, 0.00227 per cent of the total mound. The value obtained from the samples was 0.01144 per cent, nearly five times as much. This discrepancy is far too great to ascribe to chance, although the standard error of the sample mean was large: ± 23.02 per cent. Probably the source of the difficulty lies in the treatment of the mound soil during excavation. It was necessary to shovel the material several

[5] The comparative aspect may be illustrated by data from two other mounds. In Petersen I, located half a mile from Petersen III, the mean shell content was calculated as 0.009 per cent. Clearly no significant difference between the two mounds could be detected without the use of a prohibitive number of samples. For all foreseeable purposes they are identical. In a "shell mound" located in Richmond the shell amounted to 45.9 per cent by weight. This is of such a completely different order of magnitude that even an enormous standard error could not obscure the distinction.

times, break up lumps of dirt, and shake rather vigorously during the screening. All this tended to break up the fragile pieces of carbon. Conversely, the samples were handled very gently, in order to conserve the integrity of the charcoal. It must be assumed, therefore, that the estimate based on sampling is a closer approximation to the actual value than that derived from the entire mound itself.

The charcoal held by the ¼-inch screen amounted to 0.06815 per cent, with a standard error of ±9.40 per cent of the mean. In all, then, charcoal was present to the extent of 0.07959 per cent, or 38,705 grams.

The large standard error for both groups of charcoal particles found in the samples not only derives from the relatively small total quantity but also from other sources. Charcoal in many aboriginal sites represents the remains of fire pits or hearths and hence may be of some significance in evaluating the extent and type of food preparation. The occurrence of such hearths is sporadic. Hence in any particular sample there is likely to be a great deal of the substance or none at all. The variability between samples is thus increased. In Petersen III, moreover, the burial custom included frequently semi-cremation, resulting in a heavy residue of carbonized wood. It follows that if a sample is taken from the vicinity of a burial the charcoal content will be extremely high. Not only will variability be thus increased, but the charcoal derived from burials is of no theoretical significance since primary interest will center in that associated with campfires and cooking processes. It may indeed be doubted, in such a case as Petersen III, whether the determination of charcoal content repays the effort expended.

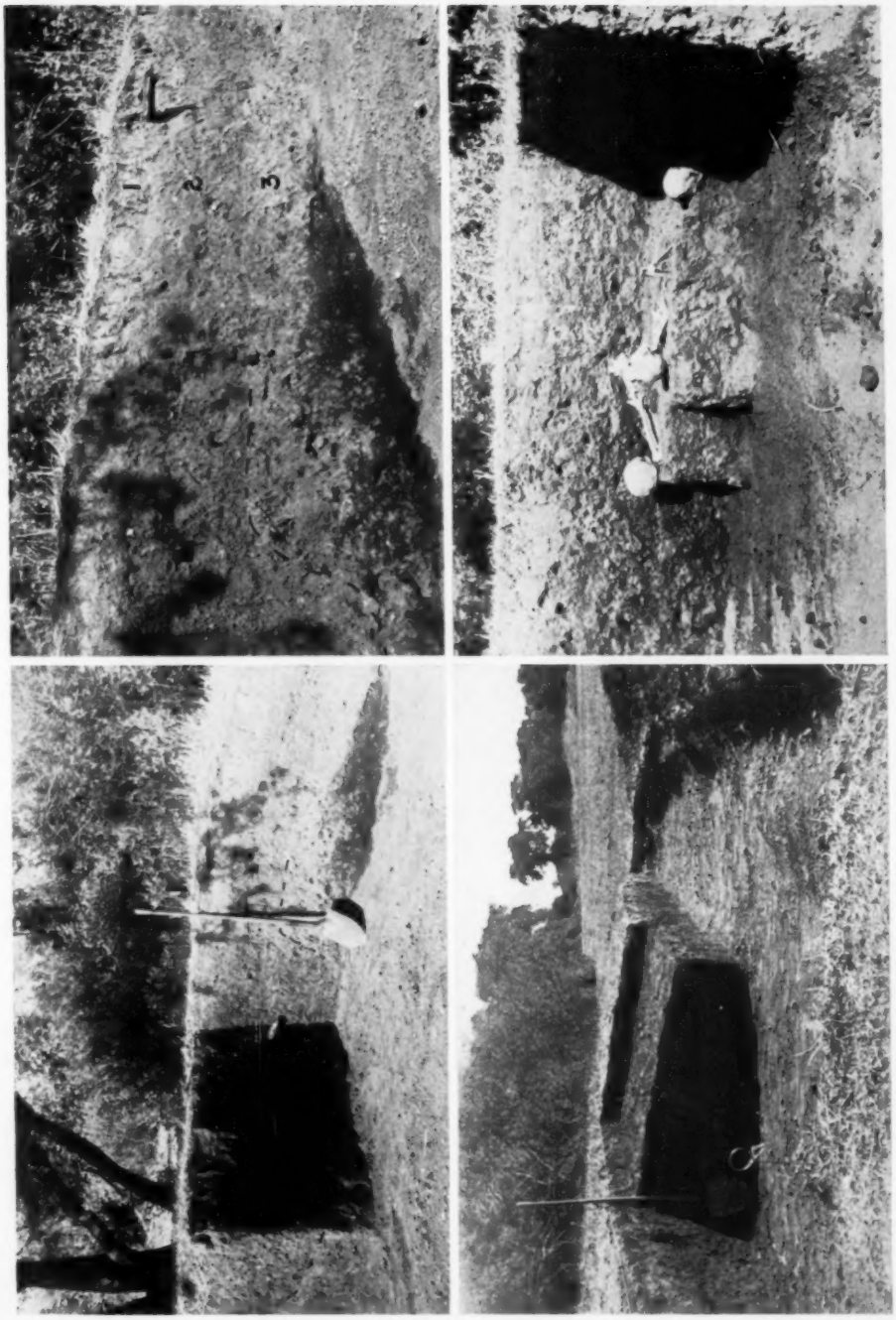
Obsidian. This component appears in Petersen III, as in most late central California mounds, in the form of completed artifacts and in the form of flakes, chips, or fragments produced during the manufacture of blades and points. No attempt was made in this study to count or weigh artifacts but the fragments held by the ¼-inch screen were included as also were all fragments found in the samples. The total weight of the former amounted to 87.238 grams, or 0.00194 per cent. In 113 samples, 109 contained no large fragments and the remaining four held one each. The mean per cent is 0.00218, a value quite close to that derived from the screening of the whole mound. This coincidence is probably fortuitous since the standard error is ±81.88 per cent of the mean. Indeed there is question whether the mean of the samples in such a case has much, if any significance, particularly since it is based upon a highly abnormal distribution curve.

The smaller fragments, those held by the ⅛-inch screen, occurred in 89 out of 113 samples. The mean per cent by weight was 0.00399 with a standard error of ±20.85 per cent of the mean. The total weight of fragments in the mound was 0.00593 per cent, or 288.38 grams. Although this value cannot be regarded as accurate to within less than nearly ±100 percent, it nevertheless establishes the general order of magnitude. Moreover it is probably a better indication of the occurrence of obsidian than the corresponding value for charcoal because (1) it is derived from only one source, the artifact industry, and (2) the fragments appear to be distributed in a purely random fashion without correlation with any other factors such as fire pits or burials.

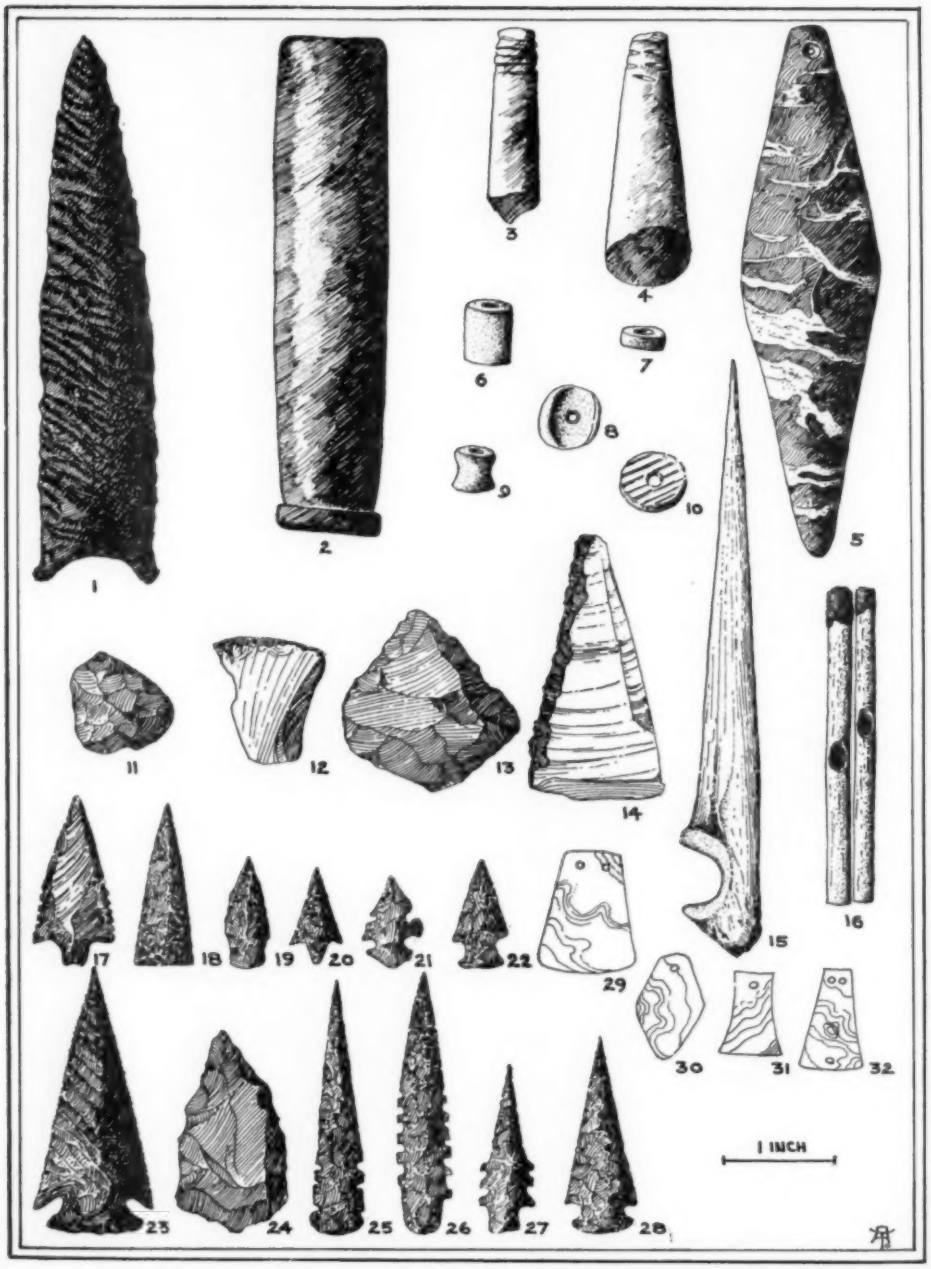
Conclusions. The study of the mound Petersen III indicates certain general principles which may be applied, with appropriate local modification, to any similar aboriginal site.

A component of the site which appears in large quantity and in a reasonably fine state of subdivision may be estimated with a fairly high degree of precision by the small sample technique. This would usually require samples of 1 to 5 pounds weight and from 15 to 30 in number. Mechanical separation of components, not chemical analysis, would be required. This method is applicable to rock, baked clay, small bone fragments, shell, etc. If the material appears in considerable quantity but in a coarse state of subdivision, such as large rocks, whole bones, and perhaps potsherds and certain types of artifacts, then larger samples, each conceivably reaching several hundred pounds in

EXPLANATION OF PLATE XXVI. *Upper left*, face of excavation; dotted line shows the extension of occupational debris down through the artificially built base of the mound. *Upper right*, close-up of face, showing the three stratigraphical layers; the dotted line again marks the extension of occupational debris down through the base of the mound. *Lower left*, excavation at the edge of the mound. *Lower right*, flexed burial with the individual lying on his back.



Excavations at Petersen Mound III, Solano County, California. (See facing page for identifications.)



Artifacts from Petersen Mound III, Solano County, California.

weight, must be taken. Alternatively the sample number must be increased, even to the hundreds or thousands. Probably the first device is to be preferred since the removal of an excessive number of samples is ordinarily beyond the scope of most investigations.

If the component is in units of small size (e.g., obsidian fragments) but is low in aggregate quantity then it will be difficult by the sampling method to secure more than an approximation of the order of magnitude of occurrence. This in many instances will prove adequate, but if refined comparisons are to be made and a high degree of precision is necessary then recourse must be had to a numerically large series of individually large samples.

Finally if the units being studied are themselves of great size, such as ash lenses or burials, then it is probable that a moderate number of samples will suffice. But each sample must be relatively enormous, involving perhaps several cubic meters of mound material. If such a procedure is adopted then a second series of samples must be taken in order to estimate the total weight or volume of the site.

ARCHAEOLOGY

Geographically, the site lies just south of the extremities of the Yolo Basin, one of the great overflow basins of the Sacramento Valley. Recent drainage ditches have probably caused some alteration of the indigenous vegetational covering. Formerly tule and swamp grass marshes must have been more extensive. As they are today, willows, cottonwoods, and oaks (Pl. XXVI, *lower left*) must have been abundant along the sloughs with oaks predominating along the higher and better drained areas, especially to the west approaching the foothills.

As evidenced from the mound debris, the inhabitants depended largely upon local plant and animal resources for their subsistence. Acorns, weed seeds, roots, tule elk, deer, fish, and aquatic fowl probably furnished the bulk of the diet. Freshwater mussels were eaten but apparently never formed an important dietary item.

There is stratigraphic evidence indicating that the deposit was probably started by laying down an artificially built base. This method of formation is different from that generally considered to have been used, namely that the construction is solely through the accumulation of habitational debris. Three well defined stratigraphic layers may be noted, all of which are lenticular in cross section and follow the normal surface contours of the site (Pl. XXVI, *upper right*). The bottom layer has the appearance of being composed of soil obtained from the nearby larger and presumably older site.[6] It appears that this borrowed soil was mixed with the natural surrounding clays, perhaps obtained from the slough bank, to form an elevation upon which houses were erected. This lower layer contained no evidence of hearths or house pits yet most of the mammal bone from this level was completely or partially calcined. The middle stratum represents a true habitational and burial level. Evidence for occupation is seen in the occurrence of hearths. It was impossible to identify any house pits or floors since the central area had been repeatedly disturbed by grave pits. The soil, however, is typical of Late horizon habitational site deposit, being dark, ashy, and friable. In the central area of the middle stratum occupation was sufficiently intensive to break through the artificial base to a depth of several feet.[7] The surficial level has no bearing on the cultural aspects of the site. It is a light yellow clay cap of the Columbia soils type, deposited in the post-1850's. With the backing up of water due to levee construction, plus the added sediment from the Sierra placers, much of the overflow areas have been subjected to considerable alluviation by fine clays.[8]

Burials and Skeletal Remains. Two methods of corpse disposal are present. Three interments are normal earth burials; nine are of the type which has been called "partial or incom-

---

[6] There is a large depression in this site which might well represent the borrow pit. It was thought to be a large dwelling or ceremonial house pit but trenching failed to produce any evidence of a floor. For the building of mounds, see Powers, 1877, p. 316; Gifford, 1927, p. 251; Beals, 1933, p. 363; Staples, 1873; Belcher, 1843, Vol. 1, p. 124. According to Loeb (1926, pp. 159–60), "the men built the sweat house in the spring time. They dug out the dirt with sharpened sticks, and with their hands, and carried it away in baskets." Such a process might account for the origin of level III in Petersen Mound III. For natural accumulation, reference may be made to Chever, 1870, p. 136; and Schenck and Dawson, 1929, pp. 317–18.

[7] Dotted line in Pl. XXVI, *upper left and right.*

[8] In recent winters the site has been under several feet of water.

plete cremations."[9] The latter is a fusionof earth burial and cremation techniques. Prior to burial a pit was dug and a fire built in it. When the fire burned down, the corpse was placed on the ashes and was covered with dirt. Such smothering retarded most of the active burning as the nether sides of only a few of the bones and some of the artifacts show only a slight amount of scorching. The carbonization of artifacts and scorching of bones is incidental to the main purpose, which was to burn grave offerings in the fire prior to burial.

In all cases the skeletons lay in a flexed position, the degree of flexure varying from loose to tight. Bodies lay on both the left and the right sides and in three cases individuals were on their backs with the legs flexed and the knees up (Pl. XXVI, *lower right*). Orientation likewise varied. In three cases heads were pointed EW; single cases were WNW, NS, NW, and NE. In the main, burials were concentrated in the dark, ashy, central portion of the mound (middle stratum). Excluding the sterile clay cap, the depths of interment varied from 3 to 39 inches. Burial 2 was the only one showing significant variation. The body lay in a tight, flexed position near the southern periphery of the mound. It is clear that this represents the first interment in the site for the body rests on the very base of the mound, being covered with light-colored claylike mound debris which is characteristic of the lower level of the site; whereas, all the other burials lay above this in the softer, darker middle level. No evidence of pre-interment grave-pit burning was noted in Burial 2, and this was the only burial without associated artifacts.

In three cases (Burials 5, 10, 12) the association of females with newborn infants suggests death due to child birth. In one instance foetal remains were noted in the pelvic cavity.

In physical type, the two male skulls which

TABLE 13. BURIALS AND ASSOCIATED ARTIFACTS

(Type designations after Lillard, *et al.*, 1939, p. 12.)

Artifacts	*Burials*											
	1	2	3	4	5	6	7	8	9	10	11	12
Tubular steatite pipe	x											
Obsidian blade	x											
Charm stones	x											
Obsidian arrow points	x		x	x							x	x
Pestles	x			x	x						x	x
Magnesite beads	x					x						
Steatite beads						x						
Claw-shaped stone objects				x								
Asphalt coated pebble				x								
Worked rib				x								
Bird bone whistles											x	x
Olivella half-shell beads	x		x	x		x		x	x	x		
Olivella circular beads (type 3e)	x			x		x					x	x
Clam shell disk beads (type 1)	x		x	x		x	x	x	x	x	x	x
Haliotis beads (epidermis)				x							x	x
Haliotis ornaments	x			x							x	x
Carbonized cordage	x											
Carbonized acorns	x			x								
Baked clay objects			x									
Sex		M	M		F					F		F
Adult		x	x		x					x		x
Child						x					x	
Infant				x			x	x	x			
Position: flexed on side		x	x						x			x
flexed on back					x	x				x		

[9] Lillard, *et al.*, 1939, p. 4.

were measured[10] fall within the averages for the Late Sacramento Valley type[11] with brachicranial heads and mesorrhine noses. Pathologic conditions were noted on one tibia from burial No. 2.

Chipped stone. A single obsidian blade (Pl. XXVII: 1) was recovered from Burial 1. In form and chipping technique the piece resembles more the types illustrated by Lillard *et al.*[12] for the transitional period (Middle horizon) of the Sacramento Valley. Its presence here may be evidence of aboriginal grave robbery.[13]

Of the 62 arrow points, 39 were complete enough to be identified as to type. Following the typology[14] already in use for the area, these types were represented: NAb1, NAb2, NBa, NBb1, SAa, SBb, SBc, SCa1, SCa2, SCa4, SCb1, SCb2. All are made of obsidian and are characteristic of the Late Sacramento Valley culture. The degree of workmanship varies from rather rough flaked pieces to those exhibiting a refined and skilled technique of pressure flaking. The seven points associated with burials (Pl. XXVII: 23, 25, 26) are of the more refined type. It is possible that they represent either special pieces made for grave offerings, or that the better finished utilitarian examples were selected for the occasion. Flaked points recovered from general digging tend to be cruder (Pl. XXVII: 17, 21, 24).

Scrapers totaled seven in number, all being made of obsidian (Pl. XXVII: 11–14). In most cases they were simply flakes which had been retouched along one side, or an elongated piece sharpened at one end. Two flat triangular pieces showed all-over flaking on the surface and would have been suitable either for use as they were, or hafted.

A single long splinter of obsidian chipped at one end probably was, at one time, attached with others to a skirt and used as a dance bangle, a feature known for northern California in historic times.

Ground Stone. The most common ground stone objects were fragments of charmstones. Of the 32 pieces found all except two are of the same type. One of these exceptions is obviously different but too fragmentary to classify. The other is a complete, highly polished, perforated, mottled granite specimen found in association with burial 1 (Pl. XXVII: 5). Its presence here is quite out of character with the Late horizon. In type it is identical with others from the Early period and may represent a case of aboriginal grave robbing. The other 30 specimens (Pl. XXVII: 3, 4) consist mainly of notched or incised ends of long spindle-shaped pieces made from fine grained sandstone, argillite, and siltstone. Many of the ends are battered and bear a coating of asphaltum. The absence of whole specimens, the high frequency of notched or serrated ends, the presence of asphaltum, and their battered ends raises a question of function for these objects. It is possible that they served the purpose of fish-line or net sinkers. If the notches and the asphaltum were for purposes of attaching a string and the stone should break while in use, then the portion brought back to the village would be these termini which still were attached to the line. In addition to serving a functional purpose they could still retain their charm potency as far as fishing was concerned. To strengthen the utilitarian and non-esthetic function, it is significant none were associated with burials.

Of the four pestles found, all were associated with burials and made of sandstone. Lengths varied from 7 to 16 inches. Typologically all specimens were alike, tapering at the hand end and rounded off near the pounding surface. The near absence (only one rim fragment was recovered) of stone mortars in the site might suggest the use of wooden ones save for the fact that the ends of all the pestles show evidence of contact with another stone. It is possible that mortars are present in the larger adjoining site and that their use may have been a communal affair.

Other objects of ground stone consisted of a single piece of flat sandstone showing a markd degree of wear on one surface. It may have served as a paint pallette or a platform upon which clam-shell disk beads were made. Salmon colored magnesite beads of both the disk and tubular form (Pl. XXVII: 7, 6) were present but rare. A well made tubular steatite pipe (Pl. XXVII: 2) was associated with Burial 1, and a single hour-glass steatite bead (Pl. XXVI: 9) was with Burial 6. A pebble coated with asphaltum suggests the former practice of coating

[10] The two skulls measured by Russell Newman are a part of a recent series on the Late Sacramento Valley physical type.

[11] Lillard, *et al.*, 1939, p. 73.

[12] Lillard, Heizer, Fenenga, 1939, Pl. 24, Figs. 1–2.

[13] Also with Burial 1 was a charm stone of type B.1 characteristic of the Early horizon. Evidence for grave robbing in Early horizon sites is not lacking, for many of the interments show post-burial disturbance.

[14] Lillard, *et al.*, 1939, p. 13.

the inside of baskets by means of melting the bituminous material with hot stones. Of unknown use was a claw-shaped stone object resembling a raptorial bird's talon.

Bone. Contrary to expectations, worked bone was not abundant. Thirteen antler tips were found, all showing evidence of having been used as tools. A few were polished and the remainder showed abrasions resulting from their use as flakers. Four large sections of antler were striated and polished at the tips indicating their use as root digging tools. Bone awls were represented by one complete specimen made from a small mammal ulna (Pl. XXVII: 15) and a highly polished mid-section from an unidentified bone. A possible awl is a small curved mammal rib pointed at one end. A pair of small bird bone whistles (Pl. 2, Fig. 16) with the asphaltum still adhering to their ends were associated with the double burial (Nos. 11 and 12). A fragment of a bone harpoon bearing a smear of asphaltum is too incomplete for type determination. A single bone splinter pointed at one end may have been attached to a line and served as a gorge hook.

Shell. Beads were made from clam shell (*Saxidomus nuttalli*) in the form of flat perforated disks (Pl. XXVII: 10). At times the hinge portion was used, producing small tubular beads. The disk form occurred in quantity as a burial association and examples were scattered at random through the entire mound mass. Beads made from the olive shell (*Olivella biplicata*) were of two sorts: perforated half shells (Pl. XXVII: 8), and a smaller form made by grinding down the spire end. Abalone (*Haliotis*) shell was fashioned into a variety of pendant forms (Pl. XXVII: 29–32). With one exception all were associated with burials and appear to have been attached to some sort of textile or basket. A small bead type was made from the epidermis of the red abalone species (*H. rufescens*).

Baked Clay. Objects of baked clay were not common. The location of the site between the stoneless Sacramento delta and the Coast Ranges undoubtedly accounts for the absence of baked clay objects. The close proximity to gravel deposits immediately to the west largely eliminated the necessity of substituting baked clay balls for rocks used in "stone boiling." Modeled clay artifacts were represented by four fragments of the ball type probably used in "stone boiling," and a single example of the spool type possibly served as a net or line weight.

Although not artifacts, several pieces of baked clay contained impressions of sticks. This may represent evidence of the application of wet clay plaster around the base of a brush house or a smoke vent. The firing could have occurred when the house burned. One other piece of flat baked clay bears a well-defined imprint of a coiled basket.

Carbonized Material. The practice of pre-interment grave-pit burning frequently results in the smothering of textile material, leaving it preserved in a carbonized state. Most of the cremation graves yielded evidence of cordage running through the strings of beads. Fragments of rods from burned baskets were present in two burials. Burials 1 and 4 contained carbonized acorns. An unidentified species of bulb preserved in a carbonized state was frequently encountered through the mound mass.

CONCLUSION

The assemblage of artifact types recovered from Petersen Mound III are, in the main, characteristic of the Late Sacramento cultural horizon. The burial custom of pre-interment pit burning places the site in the protohistoric or Phase II period of the Late Horizon. Relationships may be noted with other sites containing Phase II material, mainly the two northeastern San Francisco Bay mounds, Fernandez and Glen Cove, the lower Sacramento Delta mound C 138 (Hotchkiss), and a mound near the Coast Range foothills in the vicinity of Cordelia.

Interrelationship appears to exist between the upper levels of the larger Petersen II mound and the smaller Petersen III. Excavations in mound II indicate two cultural phases of the Late horizon, Phase II in the upper level and Phase I in the lower portion. The latter is distinguished from the upper level by the presence of tight flexed burials and the absence of pre-interment pit burning. This possibly throws some light on the question as to when the smaller mounds was first inhabited. Burial 2 in the smaller mound lay in a tight flexed position wholly within the lower level. If Burial 2 corresponds to the Phase I level of the larger site, then the building of the mound must have started at about the close of Phase I. The true habitational layer of Petersen III is typical of Phase II.

Evidence favoring construction of an artificial mound platform seems quite clear. The color, texture, and cultural data strongly suggest that such was the case. The physical analysis is even more convincing. The differences in density between the central area (living area) and the peripheral area (supposed artificially constructed base) are great enough to be interpreted in terms of differences in deposition rate. If true, then two distinct histories are involved with respect to levels II and III. The bulk of the contents of the peripheral plots are composed of level III material. If we assume that this material was carried by basket, dumped, and mixed with other non-mound debris to form the artificial base, then the accumulation of debris would be rapid, giving us the relatively low density figure of 1.295. In contrast, level II (density 1.802) made up the bulk of the central plots. Accumulation of debris through living is that of slow deposition. The mechanical factors involved in human occupation when brought to bear on the materials would result in compaction and the reduction in size of particles.

The desirability of complete excavation cannot be over-emphasized. In this case it has provided us with data which normally would have been missed had we depended solely upon trenching and test pits.

BIBLIOGRAPHY

BEALS, R. L.
1933. "Ethnology of the Nisenan." *University of California Publications in American Archaeology and Ethnology*, Vol. 31, pp. 335–414. Berkeley.

BELCHER, SIR E.
1843. *Narrative of a Voyage Round the World . . . during the Years 1836–1842.* 2 vols. London.

CHEVER, E. E.
1870. "The Indians of California." *American Naturalist*, Vol. 4, pp. 129–48. Salem, Mass.

COOK, S. F., AND A. E. TREGANZA
1947. "The Quantitative Investigation of Aboriginal Sites: Comparative Physical and Chemical Analysis of Two California Indian Mounds." AMERICAN ANTIQUITY, Vol. 13, No. 2, pp. 135–41.

GIFFORD, E. W.
1927. "Southern Maidu Religious Ceremonies." *American Anthropologist*, N.S., Vol. 29, pp. 214–57. Menasha.

LILLARD, J. B., R. F. HEIZER, AND F. FENENGA
1939. "An Introduction to the Archaeology of Central California." *Bulletin, Department of Anthropology, Sacramento Junior College*, No. 2. Sacramento.

LOEB, E. M.
1926. "Pomo Folk Ways." *University of California Publications in American Archaeology and Ethnology*, Vol. 19, pp. 149–405. Berkeley.

POWERS, S.
1877. "Tribes of California." *Department of the Interior, Contributions to North American Ethnology*, Vol. 3, Washington.

SCHENCK, W. E., AND E. J. DAWSON
1929. "Archaeology of the Northern San Joaquin Valley." *University of California Publications in American Archaeology and Ethnology*, Vol. 25, pp 289–413. Berkeley.

STAPLES, D. J.
1873. "Notes on the Indians of the Mokelumne River Region, 1849–1850." *Proceedings of the California Academy of Science*, Vol. 5, pp. 202–3. San Francisco.

Department of Anthropology
San Francisco State College
San Francisco, California

Division of Physiology
Medical School
University of California
Berkeley, California

September, 1947

SOME PROBLEMS IN NORTHEASTERN ARCHAEOLOGY

GUTORM GJESSING

IN the exceedingly important symposium, "Man in Northeastern North America," edited by Frederick Johnson, Frederica de Laguna has published a very interesting and elucidative paper, "The Importance of the Eskimo in Northeastern Archeology," dealing chiefly with the relations between the Dorset Eskimo and the prehistoric Indians of the Northeast. The subject is fascinating, indeed, partly because the Dorset culture has a rather peculiar position within the prehistoric Eskimo cultures, and partly because even the Indian cultures of the Northeast coast in many respects have cultural traits alien to other prehistoric Indian cultures. In fact, the dissimilarity between Dorset and the neighboring Thule culture is so striking that the Eskimo origin of the Dorset culture has been seriously doubted by Therkel Mathiassen and Henry B. Collins.[1] Collins, however, later agreed in the opinion, originally expressed by Diamond Jenness, that Dorset, in spite of the Indian-like features, may be an Eskimo culture.[2] On the other hand, the Indian cultures in question demonstrate "Eskimoid" features, such as barbed projectile points and semilunar knives of slate, some of which are not Eskimo at all or are absent in the Dorset culture, the only Eskimo culture with which these Indians have been in contact.

So far as barbed projectile points are concerned, the type actually is in fact definitely non-Eskimo, having been used among the Eskimos only by those of southwestern Alaska, where it is apparently due to Indian influence.[3] De Laguna is inclined to interpret the barbs on the slate points in the Northeast as transferred from barbed chipped weapons, in other words as a local development.[4] However, the barbed slate points are one of the most basic types in the slate cultures, and have an entirely circumpolar distribution.[5] Large series of barbed slate points found in northern Norway are identical with those from the Red Paint culture. In north Scandinavia the type used to be explained in exactly the same manner as implied by de Laguna, an interpretation which has been proved to be incorrect. Evidently there are no reasons to reject the Old World origin of these points.

The ulo, on the other hand, is a fairly universal Eskimo type, although it is absent in the Dorset culture. According to Martin, Quimby, and Collier, it is true, "the semilunar blade for women's knife was also lacking in some sites",[6] but, as pointed out by de Laguna, the ulos in question probably do not belong to the Dorset culture, having been found on some northern sites which have yielded non-Dorset material. Moreover, the Indian semilunar knives taken as a whole, differ from the Eskimo ulos in being better made.[7] De Laguna states, however: "Of one thing we can be sure; the Indians did not invent the semi-lunar knife independently of the Eskimo ulo, and the only people from whom they could have received it were the southern Dorset Eskimo, probably after the latter were subject to Thule influence."[8] This would imply a rather late dating for the Indian semilunar knives, and moreover, the interpretation is not very promising since the ulo does not occur at all in southern Dorset sites.

Furthermore, the ulo is probably not an Eskimo invention. It occurs in certain Arctic Siberian cultures, and is also known from the stone age of China and Japan.[9] Whether it was brought to the New World during the Eskimo migration, or was subject to later diffusion, depends on the point of time when the slate came into use in Eskimo cultures. Personally, I am not fully convinced that the use of slate is an original Eskimo trait. As previously mentioned, the Eskimo failed to adopt the most basic and widespread types, the barbed slate points. And, taken as a whole, the slate industry plays a conspicuously unimportant role in the most ancient Eskimo cultures. In the Ipiutak culture ground slate is entirely unknown. The chronological position of the

[1] Mathiassen, 1936, p. 130; Collins, 1937*a*, p. 373.
[2] Collins, 1940, p. 571.
[3] de Laguna, 1946, p. 126.
[4] de Laguna, 1946, p. 138.
[5] Gjessing, 1942, 1943.
[6] Martin, Quimby, and Collier, 1947, p. 504.
[7] de Laguna, 1946, p. 126.
[8] de Laguna, 1946, p. 125.
[9] Andersson, 1923, p. 194.

Ipiutak culture will not be finally settled, it is true, until the appearance of Helge Larsen's and Rainey's publication, but this complex is probably the oldest known Eskimo culture. It is more strongly interspersed by Old World influences than is any other known Eskimo culture; amongst others, it has the well-known bear motif from the Permian Pianobor culture and Chinese influences from the Han dynasty, both suggesting a date of the period around the beginning of our era.[10]

Ground slate occurs in the succeeding Old Bering Sea culture, but artifacts of chipped chert and other varieties of flint-like stones strongly predominate. As far as the Dorset culture is concerned, my information is somewhat divergent. While Douglas Leechman, who at the present time is working up the Dorset material, definitely denies any occurrence of slate whatsoever, George Quimby and Frederica de Laguna claim the presence of ground slate implements in the Dorset culture.[11] At any rate slate, even in this culture, apparently is of remarkably little importance. The later stages of Eskimo cultures, on the other hand, beginning with the Punuk and Thule cultures made an extremely extensive use of ground slate.

It would seem, then, that the slate industry, being a circumpolar cultural trait, diffused to the American Eskimo somewhat after the first Eskimo migration, The diffusion probably began in the Old Bering Sea period and increased greatly later on.

If such is the case, the barbed points and the semilunar knives of the Northeastern Indians might possibly receive another explanation. It is of great importance to point out in this connection that the Northeastern cultures include several types having an Old World origin. This is true for the Red Paint culture, which includes gouges, slate points, semilunar knives, animal sculptures, harpoons, fish-hooks, etc.[12] Also according to the excavations at Blue Hill, Maine, made by the Phillips Academy, Andover, Mass., which are not yet published, it is now possible to tie up the Red Paint culture with the Eastern Woodland pattern.[13] This result is fully in accord with the occurrence of Red Paint types on east Canadian sites, such as Tadoussac, Quebec.[14] It suggests a connection with the diffusion of cord-marked pottery, which is also of Eurasiatic origin with a cirumboreal distribution.[15] The suggestion has even been made that any ceramic type in the Eastern Woodland pattern has its Eurasiatic parallel.

During the last decade a great deal of work has been done in identifying cultural streams, partly from Asia to North America, partly from Asia to Northern Europe. From the point of view of Eskimo archaeology, Collins has strongly pointed out diffusions leading back to the Danish Maglemose culture;[16] and with the Neolithic material from northern Norway as a starting point, the present writer has tried to demonstrate two different routes of diffusion, one leading along the Arctic coasts and across the Bering Strait to the New World, and the other one going through the vast North Asiatic forest zone.[17] American scholars naturally have been mainly interested in ascertaining the Asiatic origin of various American cultural features, and deeply penetrating studies on this subject have been made by Vladimir J. Fewkes, James B. Griffin, W. C. McKern, William A. Ritchie, etc.[18] Recently Albert C. Spaulding has made a survey comprising the whole circumboreal region.[19] Considering the fact that both the ulo and the barbed slate point are well-known Asiatic types, we consequently will have to take into account the possibility that these types belonged to the Old World components of the Eastern Woodland pattern. In this case the ulo has probably been carried twice to North America. The possibility that the barbed points belonged to an intrusion older than the Eskimo migration is also corroborated by their presence in the prehistoric Northwest Coast culture, as stated by de Laguna.

One of the most obvious difficulties in demonstrating the Eurasiatic origin of elements of the Woodland cultures is the absence of most of these traits in the western parts of Canada and in Alaska. The northernmost find of cord-marked ceramics consists of some sherds "from Berens River 52° N, and even farther north."[20] As pointed out by McKern, the "distribution of Woodland traits suggested by these finds lies

[10] Cf. Collins, 1943, p. 222.

[11] Verbal information, for which I am greatly indebted.

[12] Moorehead, 1922; Willoughby, 1935; Ritchie, 1936; Hadlock, 1939, 1941; Rowe, 1940.

[13] Johnson, 1937.

[14] Wintemberg, 1943, p. 340.

[15] Von Richthofen, 1932; Fewkes, 1937; Gjessing, 1943.

[16] Collins, 1937, 1942.

[17] Gjessing, 1941, 1942, 1943.

[18] E.g., McKern, 1937.

[19] Spaulding, 1946.

[20] Fewkes, 1937, p. 150.

along a very logical migratory route from Asia to the Great Lakes area, including the Yukon and Mackenzie valleys."[21] It is true that it has not been possible to discover typical Woodland traits in the Yukon valley,[22] but considering the few and casual archaeological investigations in this region, it certainly would not be right to attribute too much importance to this fact.

Our knowledge of the Ipiutak, the Old Bering Sea, and the Dorset cultures suggests that the first Eskimo migration took place sometime around the beginning of our era, this being a rather conservative guess. There are no indications of the Eskimo being absent from the Bering Strait region later on. In other words, during the last two millennia the Eskimo have blocked any intrusion by Indians along this migratory route, and have even prevented the direct passage of Asiatic influences into Indian cultures. Hence, it is of great importance that several of the basic Eurasiatic features in the Woodland cultures have not been adopted by the Eskimo, such as most of the ceramic types, various types of gouges, barbed slate points, etc.

A comparative study of the folk tales from the circumboreal region will probably provide amazing results. During the war I started going through the available folkloristic material, but when the University of Oslo was closed (by the German powers of occupation), I had temporarily to put these studies away, and since then I have not had the opportunity to continue. However, among around 300 types of folk tales I found 15 with more or less circumboreal distribution, 14 of which had been transferred to the North American Indians,[23] while as far as I know, only one motif has been known to the Eskimo.[24] The latter, being from Greenland, might possibly derive from the Norse population.

The only logical way in which to interpret these significant facts is by assuming that the intrusion of the circumboreal culture complex, whether by migration or by diffusion, is older than the migration of the first Eskimo (Ipiutak culture?). This again would suggest an earlier date for the beginning of the Woodland cultures than the ones current today. McKern has implied a rather early date, without giving any guess in terms of years: "In fact, excepting reported manifestations of Early Man in Minnesota and Nebraska, available evidence indicates that it as old or older for this area than any other manifestation of human culture."[25]

This would certainly provide a better chronological link between Laurentian I–II and other contemporaneous aspects of the Woodland pattern on the one hand, and the ancestral cultures in northeastern Asia on the other. Very few chronological evidences however, are available from the latter region. The pottery corresponding to the cord-marked Woodland pottery (comb-ceramics) belongs in western and central Siberia to the Afanasievskaja culture, which developed through influences from the Iranian world around 2000 B.C., and which is supposed to have been superseded by the Andronovo culture sometime between 1500 and 1300 B.C.[26] In northern China the comb-ceramics occurs in the Chi'a-Chia culture.[27] From Kansk-Perevinskoje in the Krasnojarsk region, Upper Yenissei, is reported a find consisting of comb-ceramics accompanied by stone artifacts and a curved bronze knife of a type apparently belonging to the early Andronovo culture, the site in other words being probably not younger than *ca.* 1000 B.C.[28] Certainly this chronology can not be automatically transferred to the peripheral cultures of northeastern Asia, but in any event there is a chronological gap between the Asiatic and the Woodland pottery, which has to be filled.

According to Martin, Quimby, and Collier, Laurentian I is supposed to have been in existence from *ca.* 300 to 500 A.D., and Laurentian II, in which pottery and semilunar knives occur as new types, from 500 to 900 A.D.[29] Although the distance from Bering Strait to the Great Lakes region is very great, more than one-half a millennium seems to be too long a space of time for this diffusion, even assuming a very slow one. How far back Laurentian II has to be put certainly depends on the rapidity of this diffusion, and for the time being we can only give a guess. Compared with the supposed rapidity in the distribution of the oldest Eski-

[21] McKern, 1937, p. 142.
[22] de Laguna, 1947.
[23] Cf. Aarne and Thompson, 1928.
[24] Nansen, 1891, p. 250.
[25] McKern, 1937, p. 139.
[26] Teploukhov, 1929, pp. 42–3; Tallgren, 1936, p. 42.
[27] Menghin, 1927, p. 333.
[28] Von Merhart, 1926, p. 114.
[29] Martin, Quimby, and Collier, 1947, Fig. 122.

mo cultures (e.g., Dorset), *ca.* 200 A.D. as the beginning of Laurentian II would seem to be a fairly conservative guess, even providing that the pottery was transferred shortly before the coming of the Eskimo.

If it is true that the Woodland pottery is due to diffusion (or migration) from Asia, the occurrence of pottery in the Northeast is entirely independent of the development of ceramics in the American high cultures, whence it has diffused to the southern regions of the United States. Consequently the chronology of the pottery-producing strata in the Northeast is independent of the transition from preceramic to ceramic cultures in those regions.

Providing that the Woodland pottery really is due to Asiatic influences, there is no reason to presuppose any great rapidity in the development of this pottery. It seems to be one of the cultural laws drawn from Ethnology and Philology that cultural elements transferred into a new cultural environment usually are apt to develop more slowly than they do in their original milieu, because the contact with this cultural environment most often has been broken or anyway loosened. Hence, the chronology of the earliest phases of the Woodland pattern proposed here does not necessarily involve any great changes in the chronology of the later phases.

BIBLIOGRAPHY

AARNE, A., AND STITH THOMPSON
1928. "The Types of the Folk Tales." *Communications of the Folklore Fenniae*, No. 74. Helsingfors.

ANDERSSON, J. G.
1923. "Arkeologiska studier i Kina." *Ymer;* Vol. 43, pp. 189–247. Stockholm.

COLLINS, HENRY B.
1937. "Archeology of St. Lawrence Island, Alaska." *Smithsonian Miscellaneous Collections*, Vol. 96, No. 1, Washington.
1940. "Outline of Eskimo Prehistory." *Smithsonian Miscellaneous Collections*, Vol. 100, pp. 533–92. Washington.
1943. "Eskimo Archaeology and its Bearing on the Problem of Man's Antiquity in America." *Proceedings of the American Philosophical Society*, Vol. 86, No. 2, Philadelphia.

FEWKES, VLADIMIR J.
1937. "Aboriginal Potsherds from Red River, Manitoba." AMERICAN ANTIQUITY, Vol. 3, No. 2, pp. 143–55.

GJESSING, GUTORM
1941. "Arktisk og sørskandinavisk i Nord-Norges yngre steinalder." *Viking*, Vol. 5, pp. 75–116. Oslo.
1942. "Yngre steinalder i Nord-Norge." *Instituttet for Sammenlignende Kulturforskning*, Series B, Vol. 39. Oslo.
1943. "Circumpolar Stone Age." *Acta Arctica*, Fasc. 2. Copenhagen.

HADLOCK, WENDELL S.
1939. "The Taft's Point Shell Mound at West Gouldsboro, Maine." *Bulletin of the Robert Abbe Museum*, No. 5. Bar Harbor, Maine.
1941. "Observations Concerning the 'Red Paint Culture.'" AMERICAN ANTIQUITY, Vol. 7, No. 2, pp. 156–61.

JOHNSON, FREDERICK
1937. "Problems Surrounding the Classification of Certain Culture Complexes in New England." AMERICAN ANTIQUITY, Vol. 3, No. 2, pp. 161–5.

LAGUNA, FREDERICA DE
1946. "The Importance of the Eskimo in Northeastern Archeology." In "Man in Northeastern North America" edited by F. Johnson, pp. 106–42. *Papers of the R. S. Peabody Foundation for Archeology*, No. 3. Andover, Mass.
1947. "The Prehistory of North America as seen from the Yukon." MEMOIRS OF THE SOCIETY FOR AMERICAN ARCHAEOLOGY, No. 3.

MARTIN, PAUL S.; GEORGE I. QUIMBY; AND DONALD COLLIER
1947. *Indians before Columbus*. Chicago.

MATHIASSEN, THERKEL
1936. "The Eskimo Archaeology of Julianehaab District." *Meddelelser om Grønland*, Vol. 118, No. 1. Copenhagen.

MCKERN, W. C.
1937. "An Hypothesis for the Asiatic Origin of the Woodland Culture Pattern." AMERICAN ANTIQUITY, Vol. 3, No. 2, pp. 138–43.

MENGHIN, OSWALD
1927. "Zur Steinzeit Ostasiens." *Feschrift offerte zu P. W. Schmidt*, edited by W. Koppers, pp. 903–42. Vienna.

MERHART, GERO VON
1926. "Bronzezeit am Jenissei: ein Beitrag zur Urgeschichte Sibiriens." *Bücher Zur Ur- und Frühgeschichte*, edited by Oswald Menghin, Vol. 1. Vienna.

MOOREHEAD, WARREN K.
1922. *The Archaeology of Maine*. Andover, Mass.

NANSEN, FR.
1891. *Eskimoliv*. Kristiania.

RICHTHOFEN, BOLKO VON
1932. "Zur Frage der archäologischen Beziehungen zwischen Nordamerika und Nordasien. *Anthropos*, Vol. 27, pp. 123–51. Vienna.

RITCHIE, W. A.
1936. "New Evidence Relating to the Archaic Occupation of New York." *Researches and Transactions of the New York State Archaeological Association*, Vol. 8, No. 1, Rochester.

ROWE, JOHN H.
1940. "Excavations in the Waterside Shell Heap, Frenchman's Bay, Maine. *Papers of the Excavator's Club*, Vol. 1, No. 3. Cambridge, Mass.

SPAULDING, ALBERT C.
1946. "Northeastern Archaeology and General Trends in the Northern Forest Zone." In "Man in Northeastern North America," edited by F. Johnson, pp. 143–67. *Papers of the R. S. Peabody Foundation for Archaeology*, No. 3. Andover, Mass.

TALLGREN, A. M.
1936. "The Arctic Bronze Age in Europe." *Eurasia Septentrionalia Antiqua*, Vol. 11, pp. 1–46. Helsingfors.

TEPLOUKHOV, S.
1929. "Opyt klassifikazii drevnich metalliceskich Minusinskago kraja." *Materialy po Etnografij*, Vol. 4, No. 2, pp. 41–62. Leningrad.

WILLOUGHBY, CHARLES C.
1935. *Antiquities of the New England Indians*. Cambridge, Mass.: Peabody Museum of Archaeology and Ethnology.

WINTEMBERG, W. J.
1943. "Artifacts from Ancient Workshop Sites near Tadoussac, Saguenay County, Quebec." AMERICAN ANTIQUITY, Vol. 8, No. 4, pp. 313–40.

University of Oslo
Oslo, Norway
November, 1947

BEADS OF METEORIC IRON FROM AN INDIAN MOUND NEAR HAVANA, ILLINOIS*

ROBERT M. GROGAN

IN the summer of 1945, members of the Illinois State Museum under the direction of Thorne Deuel, Director of the Museum, excavated a group of Indian burial mounds in the Havana, Mason County area. Burial No. 10 in Mound No. 9 of this group yielded 22 rounded bead-like objects, composed of strongly oxidized iron, together with slightly more than 1000 ground shell and pearl or pearl slug beads. As the burial was evidently prehistoric and of Hopewellian age, it was at once conjectured that the iron might be of meteoric origin. In January, 1946, several of these supposed iron beads were sent to the State Geological Survey, with the request that the nature and source of the iron be determined if possible. In addition, Dr. Deuel kindly made available the data presented herein on the nature of the discovery and on the size, shape, and arrangement of the supposed beads.

The material received consisted of two complete rounded specimens less than an inch in diameter, a sawed half of another, and a fragment of a fourth specimen, all of which were more or less strongly attracted by a magnet. A qualitative chemical analysis of a bit of metal broken from the fragment showed the presence of iron and nickel. The sawed half disclosed a hole extending most of the way through the center of that specimen, and two prominent pits on opposing sides of each of the two complete specimens strongly suggested that at one time a hole had pierced their centers.

Flat surfaces were ground on all four of the specimens so that their interiors could be studied. Plate XXVIII, *a* shows the appearance of a surface ground at right angles to the axis of the central hole through one of the specimens and then etched with dilute nitric acid. A zonal or concentric arrangement of the several parts of the specimen is apparent. At the center is a core of porous limonite, then a zone of dense limonite, next a semi-continuous band of gray metal, next a zone of dense limonite, and on the outside a shell of porous limonite enclosing a few sand grains. The metal consists of two kinds of iron, one of which appears light and the other dark where etched. The same zonal structure in a section of similar orientation but on another specimen is illustrated on Plate XXVIII, *b*.

Plate XXVIII, *c* shows a ground and etched surface oriented roughly parallel to the axis of the central hole through a specimen, but not so deeply cut as to intersect any part of the hole. Here the area occupied by the metal is much greater than in sections at right angles to

* Published with the permission of the Chief, State Geological Survey Urbana, Ill.

the holes and there is no central core of limonite. This surface displays better than the others the laminated internal structure of the metal.

The appearance of a section cut through the center and parallel to the axis of the hole of a fourth specimen is shown in Plate XXVIII, *d*. The hole is lined with limonite, but still open for most of its length and filled with porous limonite in the remaining part.

The external appearance, the internal structure displayed in Pl. XXVIII, *a–d*, and data regarding the arrangement of the specimens in the burial permit certain deductions regarding the use and manner of fabrication of the specimens, all of which lead to the conclusion that they were hand-wrought metallic beads.

The small iron-bearing masses had cylindrical to flattened globular shapes and maximum transverse diameters of approximately 3/16 to 5/8 of an inch. Dr. Deuel and his associates first advanced the hypothesis that they were beads after observing that in the burial the metallic objects alternated with one or two disc-shaped, cut and ground shell beads and that their sizes varied in a manner indicating that all had been graded to size on a string.

Laboratory study substantiated this hypothesis by disclosing a hole remaining part way through one specimen and central cores of porous limonite marking the probable sites of central holes in two others. It also showed that the band of remaining metal has a conspicuous linear internal structure conforming in most places to the margin of the band, and also that the band seems to be made up of several flattened or gently curving segments connected by rather sharp bends except at one place (Pl. XXVIII, *b*) where the pattern of lamination in the metal and the limonite suggests that two edges or ends of the metal were brought together in a lap joint. This joint was the locus of a major alteration of metal to limonite. Limonite also has formed along apparent tension cracks in the sharp bends elsewhere. From the foregoing it seems most likely that the specimens were fabricated from sheets or strips of metal which were crudely worked into rough cylinders with a lapped seam along one side, thus forming beads.

The zonal arrangement of metal and limonite is explained in the following way: After their burial the beads were subjected to the action of soil water and began to rust. Rusting took place on the walls of the holes as well as on the exterior surfaces of the specimens, and produced the zones of dense limonite now found on either side of the remaining metal. The central core and the outer zone of porous limonite were probably formed by the deposition of iron hydroxide within the holes and also in the material surrounding the bead, which accounts for the sand grains found in the exterior portions of the specimens.

It has been mentioned that the metal consists of two kinds of iron as evidenced in the internal lamination brought out by etching. The metal in the dark laminae has been identified as largely alpha iron, and that in the light laminae as largely gamma iron.[1] As the iron is known to contain nickel, it is believed that the alpha iron may be properly called kamacite and the gamma iron, taenite, these being the mineralogical names for the alpha and gamma phases of the nickel-irons found in nature. In Plate XXVIII, *a–d*, the taenite laminae appear darker than those of kamacite, although actually the taenite is silvery white and the kamacite iron gray. This is because of the high reflectivity of the taenite coupled with the use of inclined rather than vertical illumination.

Various lines of evidence suggest that the iron is of meteoric origin. Supporting facts and the inferences based on them are summarized in the following paragraphs.

Steel containing nickel added by man was first introduced in 1890.[2] As the Havana iron is pre-Columbian it must therefore have come from some naturally occurring body of nickel-bearing native iron or have been smelted from an iron ore containing nickel. Native iron is of two types, meteoric and terrestrial or non-meteoric. Iron meteorites invariably contain nickel and are of widespread occurrence. Terrestrial iron is extremely rare and generally contains either very little or very much nickel. Also many iron meteorites exhibit the Widmanstätten structure discussed more fully below, the presence and character of which appears to depend upon the nickel content of the iron. It is said that the Widmanstätten structure appears only in those irons having between 6 and 14 per cent nickel.[3] The nickel content of

[1] H. L. Walker, Professor and Head, Department of Mining and Metallurgical Engineering, University of Illinois, personal communication.

[2] T. A. Rickard, *Man and Metals*, Vol. 2, p. 845, New York: The Whittlesey House, 1932.

[3] S. H. Perry, "The Metallography of Meteoric Iron," *Bulletin, U. S. National Museum*, No. 184, p. 46, Washington, 1944.

known terrestrial irons is either above or below these limits, and hence no Widmanstätten structure is present. For example, the terrestrial iron found by drilling in Clinton, Hickory, and Holden counties, Missouri, contained no nickel,[4] and of 16 analyses of the Ovifak, Disco Island, Greenland terrestrial iron only one showed more than 3 per cent nickel,[5] whereas awaruite from New Zealand contained 67.63 per cent, souesite from British Columbia contained 76.48 per cent, and josephinite from Oregon contained 64.53 per cent nickel.[6] Although Steenstrup reported Widmanstätten figures in Greenland iron from two localities near the Disco Island occurrence,[7] the work of later investigators makes it likely that a microstructure featuring an intergrowth of ferrite (alpha iron) and cementite (iron carbide) was mistaken by Steenstrup for Widmanstätten structure.[8] Supporting evidence is the low nickel content, 0.34 and 2.55 per cent, found by Lorenzen[9] in iron from the two localities described by Steenstrup. Iron ores containing an appreciable quantity of nickel are also very rare, two occurrences being in Cuba and the Netherlands Indies.[10] The Cuban ores contain 0.55 to 0.8 per cent nickel, which with a concentration of 3 to 1 by smelting would yield an iron with only about 2.5 per cent nickel.[11] Furthermore, it is unlikely either that nickeliferous Cuban iron ore would have found its way to the Hopewellian people or their contemporaries, or that they had the knowledge to smelt the ore. It therefore appears most likely that the Havana iron was derived from a meteoritic source.

The Widmanstätten structure mentioned above is characteristic of the common octahedrite variety of iron meteorites (Pl. XXVIII, *e*). The structure consists of plates of kamacite with taenite selvages arranged along regular octahedral crystallographic planes. The angular interstices between these plates are usually occupied by plessite, which is an intimate intergrowth of kamacite and taenite.

An analogous situation is found in the specimens from Havana, in that there are present laminae of taenite and laminae consisting principally of kamacite. At high magnification it is seen that the kamacite laminae exhibit a relict granularity in which the former boundaries of the kamacite crystals are marked by chains of tiny droplike particles of taenite. Because of the abundance of taenite, these laminae more closely resemble in composition the intimate mixture of kamacite and taenite, known as plessite in meteorites, than they do the ordinary kamacite laminae. Actually, pure kamacite without any intergrown taenite is almost lacking.

The laminae in the Havana specimens show, however, no regular structural arrangement in the octahedral pattern with the possible exception of the rectangular area of taenite crossed diagonally by a band of kamacite present near one outside edge of the specimen illustrated on Plate XXVIII, *d*. Nevertheless, it is considered probable that the arrangement of the laminae in the Havana iron may represent the original Widmanstätten structure present in the parent meteoric iron, now rearranged and partially obliterated as the consequence of cold

[4] E. T. Allen, "Native Iron in Coal Measures in Missouri," *American Journal of Science*, 4th Series, Vol. 4, pp. 99–104, New Haven, 1897.

[5] J. D. Buddhue, "Native Iron and its Alloys," *The Mineralogist*, Vol. 4, No. 5, pp. 3–4, 29–35, 1936.

[6] J. D. Buddhue, *idem*.

[7] K. J. V. Steenstrup, "On the Occurrence of Nickel-iron with Widmanstätten's Figures in the Basalt of North Greenland," *Mineralogical Magazine*, Vol. 6, pp. 1–13, 1884.

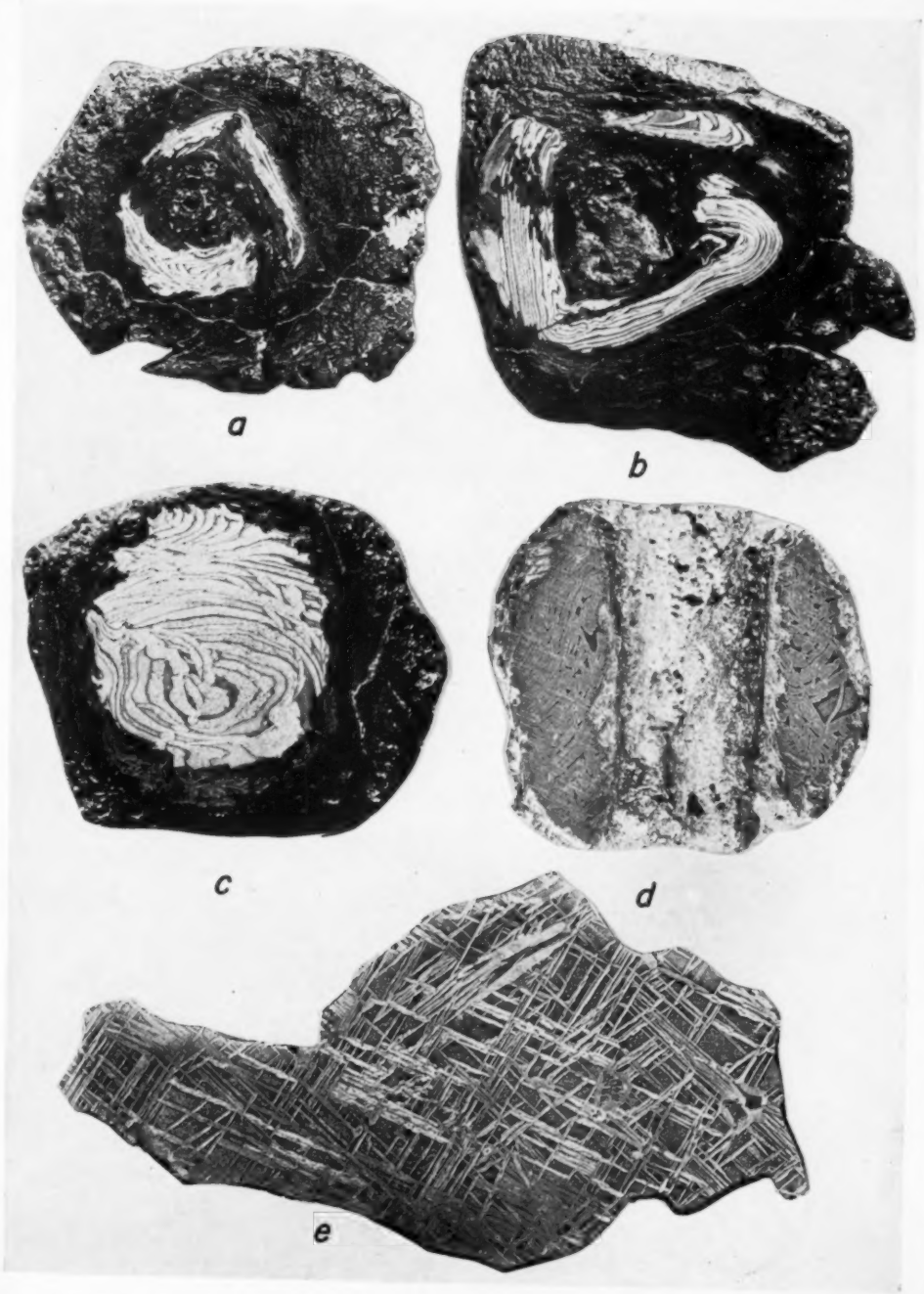
[8] See Sir H. Carpenter, "Native Iron from West Greenland," *Nature*, Vol. 136, No. 3430, pp. 152–3, 1935.

[9] J. Lorenzen, "A Chemical Examination of Greenland Telluric Iron," *Mineralogical Magazine*, Vol. 6, pp. 14–38, 1884.

[10] T. A. Rickard, *Man and Metals*, Vol. 1, p. 170, New York: The Whittlesey House, 1932.

[11] T. A. Rickard, *op. cit.*, Vol. 2, p. 846.

EXPLANATION OF PLATE XXVIII. *a*, polished and etched section through first bead, cut transverse to axis of central hole; metal portion light gray, alteration products dark; long dimension of specimen about one inch. *b*, transverse section of second bead, polished and etched; metal light gray, oxides dark; note parallel lamination in metal and arrangement of straight-sided segments connected by sharp bends; longest dimension of specimen about one inch. *c*, tangential section of bead, cut approximately parallel to the axis of the central hole, polished and etched; note random pattern of lamination; long dimension of specimen about three-quarters of an inch. *d*, section of bead cut along the axis of the central hole; boundaries of hole are distinct even though the hole is partly filled with porous limonite. *e*, undistorted octahedral structure in the Thurlow meteorite; lath-like areas of kamacite and taenite border rectangular "fields" of plessite. Photographs *a–d* by L. D. Vaughn; photograph *e* courtesy of E. P. Henderson, U. S. National Museum.)



Sections through iron beads from a mound near Havana, Illinois and through a meteorite. (See facing page for identifications.)

working of the metal by man.

In the working of the metal to shape it into cylinders any original metallic structure would have suffered a considerable amount of deformation. Such deformation actually is evidenced by the stretched-out pattern of the taenite and the kamacite laminae and also by a unidirectional flattening of the original kamacite grains shown at many places by the taenite particles which marked the former kamacite grain boundaries. In spite of this, however, at magnifications of 800 to 900 diameters, it may be seen that the kamacite is now made up of tiny, undeformed, approximately equiaxial crystals. In Professor Walker's opinion[12] this indicates a recrystallization of the kamacite resulting from a mild heat treatment subsequent to the forming of the metal into the bead shapes. Such a heat treatment might have been attained by a mild heating in a campfire or altar fire for a period of no longer than 30 minutes.

The work of many investigators has demonstrated many instances of the fabrication of meteoric iron into ornamental or useful objects by primitive peoples. An excellent summary of the available data has been given by Zimmer.[13] Predynastic Egyptian iron beads containing 7.5 per cent nickel[14] were tubular in construction and were apparently made by cold bending a flat strip of the metal.[15] Eskimos used knives whose cutting edges were composed of flakes of meteoric iron set in a groove in walrus bone. Peary found that the iron was obtained from a large meteorite. The Eskimos pounded the meteorite with stones until small ridges of metal were formed, which could be detached in the form of flakes for use.[16] Most important of all because of their cultural relations with the Havana mound builders, the peoples who constructed the Porter, Hopewell, Turner, and Liberty groups of mounds in Ohio fabricated numerous ornamental objects of meteoric iron as well as of copper, silver, and gold.[17] The meteoric iron was found as nuggets and worked into headplates, breastplates, beads, coverings for ear-plugs, adze blades, chisels, and drills. In several of its applications it was necessary that the iron be pounded into flat plates, and it is apparent from some of the objects made that these people well understood the technique of fabricating cylindrical objects from flat strips of metal. Many of the objects from the Ohio mounds were found on altars and had evidently suffered some effects of heat. Kinnicut[18] reported that one irregular cubical mass of heavily oxidized iron from the Turner mounds analyzed 86.66 per cent iron and 12.67 per cent nickel and showed well-marked Widmanstätten figures.

On the basis, therefore, of the nickel content of the iron in the Havana beads, its prehistoric age, the presence of relict Widmanstätten structure, the rarity and chemical dissimilarity of terrestrial irons, and the fact that primitive peoples of both similar and dissimilar cultures are known to have made use of meteoric iron for useful and ornamental objects, it is concluded that the Havana iron is of meteoric origin.

State Geological Survey
Urbana, Illinois
September, 1947

[12] Personal communication.

[13] G. F. Zimmer, "The Use of Meteoric Iron by Primitive Man," *Journal of the Iron and Steel Institute*, Vol. 94, pp. 306–49, 1916.

[14] Rickard, *op. cit.*, Vol. 2, p. 864.

[15] Rickard (*op. cit.*, Vol. 1, p. 146) makes reference to G. A. Wainwright, "Iron in Ancient Egypt," *Cairo Scientific Journal*, August, 1914.

[16] Rickard, *op. cit.*, Vol. 1, pp. 140–1.

[17] F. W. Putnam, *Peabody Museum of American Archeology and Ethnology Reports*, Vol. 3 (16th and 17th Annual Reports), pp. 171–3, Cambridge, 1880–86.

F. W. Putnam, *American Anthropologist*, O.S., Vol. 5, p. 49, Washington. 1903.

C. C. Willoughby, "Primitive Metal Working," *American Anthropologist*, O.S., Vol. 5, p. 55, Washington, 1903.

C. C. Willoughby, "The Art of the Great Earthwork Builders of Ohio," *Annual Report of the Smithsonian Institution*, 1916, pp. 492–5, Washington, 1917.

[18] L. P. Kinnicut, "Report on the Meteoric Iron from the Altar Mounds in the Little Miami Valley, Ohio," *Peabody Museum of American Archeology and Ethnology Reports*, Vol. 3 (16th and 17th Annual Reports), pp. 381–4, Cambridge, 1880–86.

A HOPEWELLIAN BURIAL SITE IN THE LOWER REPUBLICAN VALLEY, KANSAS

FLOYD SCHULTZ AND ALBERT C. SPAULDING*

THE senior author has for a number of years worked on the problem of the numerous and virtually unknown burial sites on the bluffs bordering the valley of the Republican River in Geary and Clay Counties, Kansas. This work has been a matter of some urgency, owing to the prevalence of unsystematic amateur excavation on the more prominent stone cairns found in the area. Fortunately, the complete excavation of the larger cairns involves too much labor for the merely curious, and it has often been possible to salvage material and information despite disturbance.

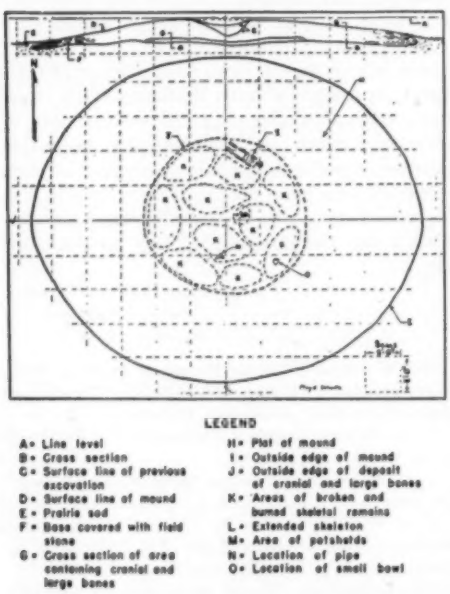

LEGEND
A- Line level
B- Cross section
C- Surface line of previous excavation
D- Surface line of mound
E- Prairie sod
F- Base covered with field stone
G- Cross section of area containing cranial and large bones
H- Plat of mound
I- Outside edge of mound
J- Outside edge of deposit of cranial and large bones
K- Areas of broken and burned skeletal remains
L- Extended skeleton
M- Area of potsherds
N- Location of pipe
O- Location of small bowl

FIG. 54. Plan and section of the James Younkin Mound, Geary County, Kansas.

It is apparent that the trait of utilizing topographically prominent points for mortuary purposes has a wide range in time in this area, as it does elsewhere in the Plains. Some of the sites, however, have produced material which sheds additional light on the distribution and content of the western Hopewellian manifestations and further suggests the presence of a heretofore undescribed horizon in the Central Plains. The authors are fully aware of the desirability of a careful description and comparative analysis of all the material at present available, and hope to complete such a study in the future. The present paper will be largely confined to a description of the James Younkin mound, one of the more productive sites, with the intention of indicating the general nature of the material.

The James Younkin site is located in Geary County, northeastern Kansas, about 5.8 miles northwest of Junction City.[1] It occupies the top of a small but prominent knoll at the border of the uplands overlooking the flood plain and channel of the Republican River, which lies about a quarter of a mile to the south. Excavation was conducted by the senior author in 1931, using leveled north-south and east-west lines for horizontal and vertical control.

The site was a low mound of stone capping the summit of the hill on which it was situated. Major horizontal dimensions of the mound were 47 feet (east-west) and 56 feet (north-south), and the maximum depth of fill was 4.2 feet (see Fig. 54). At the center of the mound a depression marked the site of a previous superficial excavation. The bottom of the structure appeared to follow the original contour of the hill except in the central section, where the surface had been removed to leave a shallow, circular depression about 23 feet in diameter. The floor of this depression was covered with a rough layer of stone. Within the depression deposits of fragmentary human bones, an extended skeleton, animal bones, and artifacts were noted. The mound was constructd by placing the fill of angular field stone and a small amount of earth over the mortuary deposit, apparently

* This paper was prepared under the auspices of the Museum of Natural History, University of Kansas, during the period when Spaulding was Assistant Curator of Anthropology at that institution.

[1] NW. ¼ of the SE. ¼, Sec. 17, T. 11 S., R 5 E. The site is named for the owner, whose kind permission made excavation possible.

without any attempt to build a vault or other burial structure. Since the nearest available supply of stone lay some 200 yards to the south, it is clear that the building of the mound was the result of an intensive or long continued effort.

Skeletal remains certainly represent a number of individuals, although we have not attempted a detailed tabulation. With the exception of the extended skeleton, which was presumably a flesh burial, the burials are simply areas of concentration of bone fragments, comprised mostly of parts of cranial and long bones. Ten such areas were observed within the central depression, and may have been individual loads of bone fragments brought to the burial site. A few of the fragments within the central basin are scorched or calcined, suggesting partial cremation before their interment, and a number of calcined pieces were found in the stones and earth of the fill above. Whether the latter were accidentally included at the source of the construction material, deliberately added to the fill, or were in some way derived from the primary deposits below is not clear. The available evidence does not indicate firing *in situ*. The flesh burial was extended on the back with the head to the southeast, and was placed near the northern margin of the central depression.

The artifacts and animal bones, like the human skeletal material, were concentrated in the central depression, but again a number of specimens were taken from the mound fill above or outside of this area. Some of the specimens are in fragmentary condition, suggesting association with the human bones prior to their deposition in the mound, but a small complete pottery vessel, numerous unbroken bird bone beads, and other intact specimens in the central area and the fill may have been placed there as special mortuary offerings. The presence of artifacts in the mound fill again raises the question of accidental inclusion at the source of the fill material. This seems unlikely, however, in view of the nature of the construction, the character of the included material, and the location of the site. The most probable explanation appears to be additional mortuary deposits of a minor nature subsequent to the preparation and covering of the central feature.

Pottery recovered from the burial includes one unbroken vessel and sherds from three others. All of the pottery was found within the main deposit in the central area (Fig. 54, M and O). The complete vessel (Pl. XXIX, *c*) is a small, nearly straight-sided jar with conoidal base and slightly flaring rim. Its maximum height is 72 mm. and its greatest diameter, which occurs at the orifice, is 62 mm. Body walls and the flattened lip range from 6 to 9 mm. in thickness, giving a heavy appearance for so small a vessel. From 15 to 20 mm. above the base is a constriction, as if the vessel had been placed in an annular stand while still plastic. Both inner and outer surfaces are inexpertly smoothed. Color is prevailingly dark from smoke, the interior especially being almost completely darkened. In a few areas an unclouded grayish tan color is visible. Decoration occurs on the top of the flattened lip in the form of two rows of approximately rectangular indentations. The rim area is smoothed and is set off from the body by a single, narrow, horizontally incised line about 6 mm. below the lip. Below this line the body of the vessel is decorated by dentate stamping, probably executed with an eight-toothed tool. The stamping is arranged in six parallel rows which spiral irregularly around the body from the base to the lower rim border. In addition to these, there are a few lightly stamped series of impressions applied vertically. Numerous small flakes of mica are visible on the exterior surface and eroded spots show a sandy paste texture. The hardness is about that of calcite.

A second vessel, represented by three rim sherds, can readily be identified as a Hopewell Zoned Stamped four-lobed jar (Pl. XXIX, *b*). The vessel is rather small, having an estimated orifice diameter of about 70 mm. and a maximum body diameter in the neighborhood of 100 mm. Total height was probably about the same as the maximum diameter. Body and rim walls are approximately 5 mm. in thickness. Form and decoration appear to be quite characteristic. The lip is undecorated, narrowed, and flattened; the rim is channeled interiorly and is crosshatched on the exterior with narrow incised lines terminated on the lower border with a line of short, nearly vertical incised strokes. The rim is nearly vertical and about 8 mm. in height. Below the rim is a smoothed neck area some 6 or 7 mm. in height bordered below by a shallow incised line. Two sherds show portions of the lobes, which are covered with plain rocker stamping. These stamped areas are bordered by incised lines and the intervening spaces are smoothed. The exterior of the vessel is predominantly a smoky gray in color, but the interior is nearly unclouded and is characteristi-

cally tan in hue. The paste is dark, the light tan color appearing only on the surfaces of the vessel. Paste texture is quite fine and appears slightly sandy under low magnification. Occasional small fragments of tempering material, probably quartz, are visible. Hardness falls between 3 and 4.

The third vessel is a large jar of Woodland type (Pl. XXIX, *a*). Sherds found made possible a partial restoration of the upper part of the vessel, including a portion of the rim, and two other sherds formed some part of the base. This reconstruction indicates a vessel having a rim diameter of about 130 mm. and a maximum diameter of some 200 mm. The lip is flattened and nearly level. The rim is about 45 mm. in height and flares outward very slightly. It merges with the shoulder in a smooth curve which continues to the point of maximum diameter about 170 mm. below the lip. The shape of the base is unknown, but the curvature of the small portion present rather suggests a pointed bottom. Thickness ranges from 7 mm. at the lip to a maximum of 14 mm. in the basal sherds. The exterior is covered with closely spaced vertical cord impressions. The impressions are clearly defined and do not ordinarily overlap, although occasional areas are present which show overlapping diagonal impressions of the paddle. The interior of the rim also shows impressions over a band extending from a few millimeters below the lip downward about 40 mm. The interior impressions resemble the "cord-wrapped stick" type and might be the result of using a vertically placed paddle edge as an anvil. The interior is smoothed below this roughened area. Surface color ranges from tan to dark gray in smoked areas. The paste core is dark. Fracture is irregular and large angular fragments of quartz and unidentified tempering material are visible. Hardness is about 3.

Three body sherds, almost certainly from one vessel, constitute the remainder of the pottery from the site. No reconstruction of form is possible, but the thickness (6 to 9 mm.) and curvature of the sherds suggest a vessel of fairly large size. All of the sherds show traces of crudely executed plain rocker stamping which has been nearly obliterated by subsequent smoothing. On one sherd a zone of this stamping is bordered by a broad, shallow, incised line. A second sherd shows several series of barely discernible rocker marks, suggesting that large areas of the vessel had been roughened by this technique prior to smoothing. Color on the exterior is grayish tan, but most of the interior surfaces are covered with a black coating which can be scratched with the fingernail. In general the paste core is somewhat darker than the exterior surface. Under low magnification the paste appears sandy, and fracture is irregular. Particles of tempering material as large as 0.5 mm. are rare.

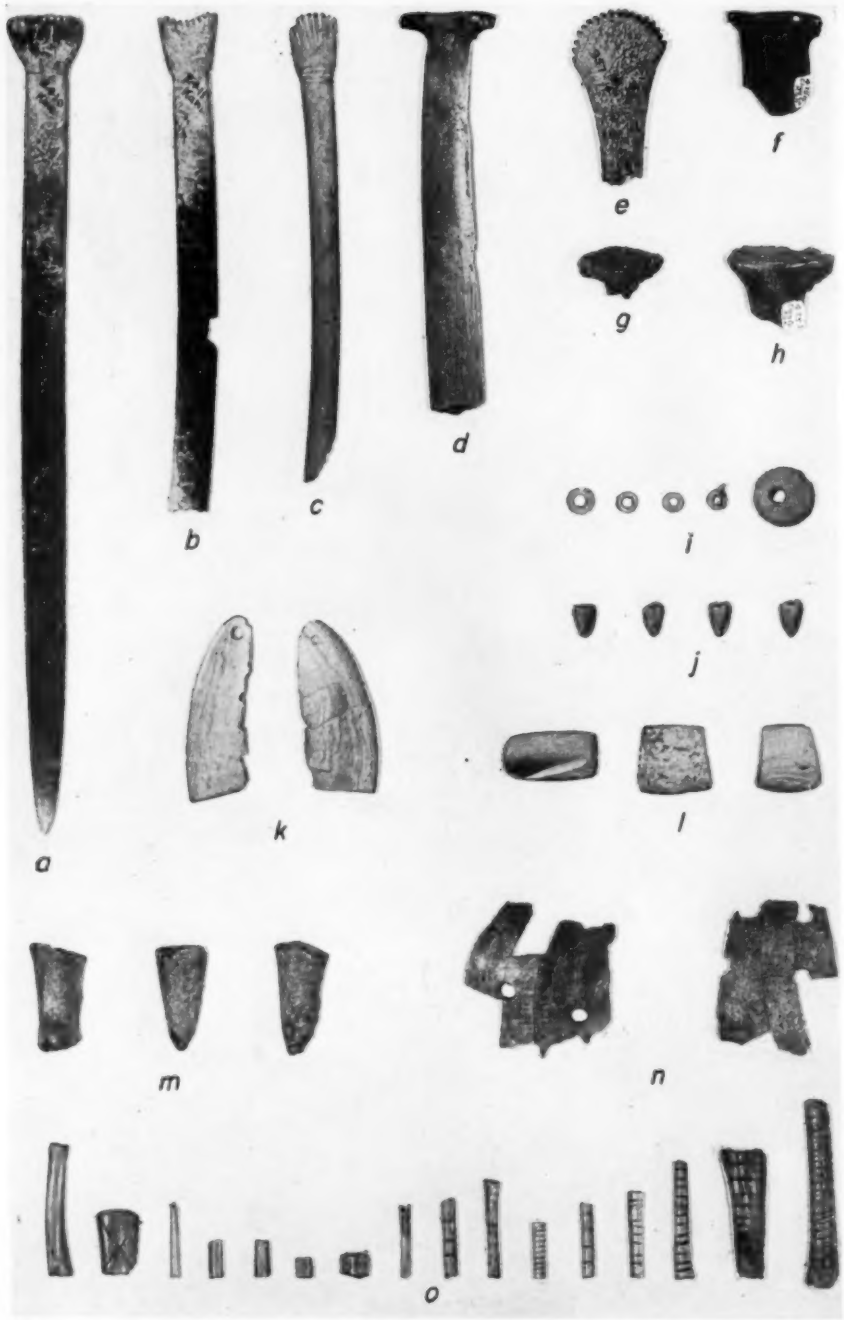
Work in chipped stone is represented by thirteen specimens, of which nine can be classified as projectile points. A crudely chipped scraper, an ovoid knife, and two fragments of knives or projectile points complete the list. With the exception of two points which were found near the mound base, this material was scattered through the fill. Special association with bones or other artifacts was not observed in any case.

Eight of the projectile points fall into the SCa2, SCa3, SCb2, or SCb3 types,[2] and five of these constitute a very definite type (Pl. XXIX, *f*). The latter are slender, straight-sided, corner-notched points with straight or slightly concave bases. The edges are delicately serrated for their entire length. Three complete specimens of this type range from 33 to 36 mm. in length, and maximum diameter (across the barbs or shoulders) varies from 11 to 16 mm. Workmanship on these points is excellent. Three smaller points are of the same general shape and two of these also have serrations, although less regular and complete, but the chipping is less precise and they are not so slender. The remaining complete point is a larger shouldered specimen with contracting stem. Two fragments of knives or points were found. The first of these is a portion of a blade about 17 mm. wide with both tip and base missing. In transverse section this fragment is uniformly lenticular with a thickness of about 5 mm. The second fragment is the tip of a projectile point or knife; this implement was of considerably larger size, having a maximum diameter of 28 mm. at the base of the broken portion, although the total length of the fragment is only 28 mm.

The remaining two chipped stone specimens consist of the ovoid knife and the scraper mentioned above (Pl. XXIX, *g* and *e*). The knife has a quite regular outline produced by fine marginal chipping and both faces show shallow flake scars. It was apparently made from a large spall, as the long axis has a regular curve. Its length is 102 mm., maximum width is 41 mm., and maximum thickness is 10 mm. The

[2] As defined by Strong, 1935, pp. 88–9.

Pottery and stone specimens from the James Younkin Mound, Geary County, Kansas.



Bone, shell, and turtle shell specimens from the James Younkin Mound and related sites: *d*, *e*, *g*, *i-o*, from the James Younkin Mound, Geary County, Kansas; *a–c*, *f*, *h*, from various other sites in Geary and Clay Counties, Kansas.

scraper is 73 mm. in length, 45 mm. broad, and 26 mm. thick. It is essentially a heavy plano-convex end scraper, although the crudeness of the flaking makes this description approximate. The outline approaches a sub-rectangular shape and the working end, which is somewhat broader, has vertical retouching. The specimen shows no signs of wear.

The only example of work in ground stone is a platform pipe of pink to buff colored limestone found near the floor of the mound in the location indicated on the horizontal plan (Pl. XXIX *d*).[3] The base of the pipe is 95 mm. in length and 35 mm. wide immediately below the bowl, the point of maximum width. Viewed from above the base tapers smoothly toward the ends from the point of maximum width; the ends are approximately square and measure 17 and 20 mms. in width. The mouthpiece end is the broader. In side view the base is slightly curved with the concave side downward. The basal cross section is lenticular and thickens in the central portion. The bowl is a plain cylinder with rounded lip rising 22 mm. above the base and having an external diameter of 23 mm. It is not centered longitudinally, being a few millimeters closer to the mouthpiece end of the base. A cylindrical hole some 4 mm. in diameter connects the mouthpiece and the interior of the bowl. It is placed slightly to the right of the center line of the base. The pipe is smoothly finished and the pink and buff coloring of the limestone gives the specimen an attractive appearance.

Artifacts of bone are numerous and include some novel types for the area. Fragments of three or more long bone pins (Pl. XXX, *d*, *e*, *g*) were present. Two of these have flat, horizontally expanded heads with broad flat shafts extending down from one side of the head. These were probably made from a part of the articular surface and shaft of a long bone, although they have been too extensively worked to make identification possible. The heads, viewed from above, are roughly elliptical or crescentic in shape. One measures 30 mm. on its long axis and 10 mm. on the shorter axis. The shaft of this specimen is about 16 mm. broad and measures 125 mm. to the broken distal end. No tapering occurs in this distance. In cross section this shaft is concavo-convex, presumably a reflection of the shape of the bone from which it was fashioned. The head of the second specimen is broken, but was probably about the same size as the first. Nearly all of the shaft is missing, but the short remaining sections shows two parallel, horizontal, incised lines immediately below the head. The third specimen is of a different type, having a decorated head which is simply an expansion of the flat shaft. The top of the head is shaped into a grooved arc, with each of the two edges thus produced serrated by notching. Across the base of the arc the head measures 30 mm. in breadth. It tapers rapidly downward into the shaft, which is 13 mm. wide at its broken end. The specimen averages about 7 mm. in thickness, the head being somewhat thicker than the shaft. Both sides of the specimen show cancellous bone structure. In addition to the recognizable artifacts described, a number of fragments appear to be parts of the flat shafts of these or similar pins. This type of artifact appeared in several other burials in the area, and additional examples are shown in Plate XXX, *a*, *b*, *c*, *f*, *h*.

Equally surprising in this horizon are four worked bison ribs which resemble closely the beamers of later horizons. These range from nearly two feet to slightly less than a foot in length. The ends are finished by diagonal cuts or rounding, and in one case by simply smoothing the articular head. The beamers are polished by wear and handling. Another worked bone, possibly a part of a beamer also, was made from the shaft of a human fibula. The fragment, about 190 mm. in length, is broken at one end and diagonally cut at the other. The cut end has a polished and worn appearance. Parts of both halves of a canine (probably dog) mandible which had been cut vertically through the symphysis were also found. No other trace of working was found on these pieces, although the right half is complete except for a part of the ramus. Fragments of an upper jaw, probably from the same animal, came from the same locality. A broken awl occurred near the surface of the mound; this is a slender type probably ground from a splinter of a long bone. A polished section of bird bone 72 mm. long may be a part of another awl. An implement or ornament of unknown type is represented by a small fragment of blackened and polished bone showing a part of a biconical perforation. The small remaining fragment suggests a pendant or other tabular ornament.

Bird bone beads (Pl. XXX, *o*) were found in

[3] Identified by Dr. R. M. Dreyer, Department of Geology, University of Kansas. Limestone similar to this occurs in Permian deposits in northern Kansas.

quantity and constitute the most common type of artifact at the site. In several cases groups were found in restricted areas or pockets, presumably as a result of the deposition of a single strand. The total number of bone beads collected is 670, of which 209 are decorated by incising. Sizes range from small, slender specimens 2 mm. in diameter and 6 mm. long to larger types with corresponding dimensions of 12 and 60 mm. The smaller varieties are more common. Fifty-three of the beads constitute a separate type characterized by a relatively large diameter and short length; a typical example of this class has a diameter of 7 mm. and a length of 6 mm. Decoration is confined to the more slender variety and consists preponderantly of either annular or spiral incising evenly spaced over the entire length of the bead. Neatness of execution and size of the incised lines exhibit considerable variation, with a tendency for the coarser work to appear on the larger specimens. In some cases the line fails to encircle the bone completely. A few small beads have a distinctive, very fine type of incising, apparently done with a delicate multi-toothed implement, as the lines fall into repeated groups of recognizable character. In the latter type the incising is strongest on the longitudinal ridges of the bone, being faint or absent on the flat surfaces. One large flat bead has as its only decoration an incised *X* on each of the flat surfaces, a unique decorative element for the site. As was noted above, the beads occurred in several restricted areas, and the excavator observed that the specimens in a single deposit resembled each other closely.

Fifteen worked deer phalanges (Pl. XXX, *m*) complete the list of bone artifacts from the site. Most of these were prepared for use by cutting off the proximal end so as to expose the internal cavity, whittling or grinding the distal end to a more or less conical shape, and perforating the bone near the distal end. The perforation is usually directed into the end of the internal cavity from the side, although a few of the phalanges have the lower end trimmed transversely to produce the perforation.

Among a number of fragments of turtle shell found in the excavation were five which show one or more round perforations ranging from 6 to 9 mm. in diameter (Pl. XXX *n*). One specimen, about 50 by 35 mm. in over-all size, has parts of five perforations fairly evenly spaced some 20 mm. apart in two rows.

Shell work is abundantly represented and includes over 600 disc beads, two pendants, four *Marginella* beads, and four conch columella beads. The disc beads (Pl. XXX, *i*) are, with one exception, rather small; diameters of a sample group varied from 5 to 8 mm. and thicknesses from 1 to 3 mm. Central perforations are from 2 to 4 mm. in diameter. Definite identification of the material from which these beads were made is not possible, but their nacreous appearance gives some reason to suspect that it is marine shell rather than freshwater mussel.[4] The larger disc bead is 17 mm. in diameter and 4 mm. thick. The *Marginella* beads (probably of the species *labiata*) were prepared for use by removing the spires (Pl. XXX, *j*). The conch columella beads (Pl. XXX, *l*), one of which was found beneath the skull of the extended skeleton, were extensively worked and show considerable evidence of wear. Three are from 15 to 18 mm. in length and have a flattened elliptical cross section with major and minor axes of about 10 and 17 mm. The fourth is 25 mm. in length and more nearly cyclindrical; this specimen shows the original spiral groove of the columella, in contrast to the first three. The perforations of these beads are about 5 mm. in diameter, and in one case elliptical in cross section as a result of wear. The shell pendants (Pl. XXX, *k*) are strips of ground mussel shell, probably intended to be a pair, as they were found in the same section of the mound floor and resemble each other closely. Total lengths of the pendants are 50 and 52 mm.

A small quantity of unworked animal bone was also present. All identifiable fragments indicate a fauna like that of the historic period in the area, and include bones of mole, ground squirrel, grasshopper mouse, cottontail rabbit, pocket gopher, and wood rat.[5] In addition to these commonplace species, however, were fragments of a muskrat mandible, a frog urostyle, wing bones of a bird (probably woodpecker), a large claw (probably eagle), and two rays from the tail of a large fish. Still other fragments include unworked pieces of turtle shell, teeth of carnivores, and deer and bison

[4] Identifications and technical opinions on shell artifacts were contributed by Dr. A. Byron Leonard of the Department of Zoology, University of Kansas.

[5] Most of the identification of animal bone was the work of Edwin C. Galbreath, graduate student in the Department of Zoology, University of Kansas. Various members of the zoological staff of the Museum of Natural History, University of Kansas, were informally consulted on a number of points with most helpful results.

teeth. The presence of this material again brings up the question of the general nature of the mortuary complex represented here. The mole, small rodent, and rabbit bones are presumably intrusive, although the excavator did not note any obvious gopher or root holes, but the muskrat, bird, ungulate, fish, and carnivore remains suggest human transportation.

An exhaustive comparative analysis of this manifestation does not seem warranted until the available material from related sites is described. There are, however, some aspects of the complex which cannot be ignored in even a cursory comment. The first and most obvious of these is a connection with Hopewellian culture, whose nearest well known occurrence is in the Kansas City area 130 miles to the east. A second point is an apparent relationship with the preceramic horizon of the southeastern area represented by Indian Knoll and other sites.

Affinities with the Kansas City Hopewellian complex are evident in the ceramics, the platform pipe, and less certainly in the general nature of the mortuary complex. Comparison of the Kansas City and Geary County sites is handicapped by the scarcity of mortuary deposits from the Kansas City area, most of the material there having come from the Renner village site.

In regard to ceramics, the detailed resemblance for the four-lobed vessel to specimens from the Renner site and the Babcock B mound site is plain.[6] The small complete vessel is not closely paralleled by any of the Kansas City specimens, but the concepts employed are within the general range of the Kansas City pottery.[7] Plain cord-roughened jars are also reported from the Renner Site.[8] Finally, the three Younkin site sherds having carelessly executed rocker marking, in one case separated from a plain area by an incised line, are of a type well represented at the Renner site.[9]

The limestone platform pipe from the Younkin site is unique in the Kansas-northwestern-Missouri area, but a fragment of a clay specimen has been reported from the Trowbridge site.[10] Chipped stone from the Younkin site does not present such detailed evidence of connection. In particular, the small, corner-notched points with delicate serrations do not correspond closely with any of the Renner site specimens. The closest approach to this type in the Kansas City area is a small, serrated point from the Steed-Kisker village site.[11] The ovoid knife also looked more at home in the Middle Mississippian Steed-Kisker and Shepherd mound complexes.[12] Of the remaining chipped stone specimens only the heavy scraper strongly suggests Renner site types.[13] The point with contracting stem and the fragments of larger points or knives are probably within the range of the Renner site material.

A direct comparison of burial practices, based on the assumption that the stone vault and some of the earth mounds of the Kansas City area are of Hopewell origin, furnishes some further similarities. The mounds excavated or investigated by Wedel[14] show such structural features as a central pit covered by a layer of rock slabs, several examples of rectangular stone-walled enclosures, and a simple earth mound. Artifacts from these sites were anything but abundant, but the stone enclosures have produced fragmentary human bone, both burned and unburned, some primary interments, and evidence of fires within or around the enclosures. The earth mound of presumably Hopewellian origin (the Renner mound) contained both extended and bundle burials covered by stone slabs. The Younkin mound obviously differs from the stone enclosures structurally, but shares such features as the extensive use of stone in construction, some concept of a central deposit, and a combination of flesh and bone burials. A more distinctive link between the two areas is the deposition of fragmentary bone, sometimes burned. Some of the Kansas City sites show evidence of fires in or on the mortuary deposit, a point of contrast. Another point of contrast is the relative abundance of specimens from the Younkin mound, but this may de due, at least in part, to lack of the disturbance which was so prevalent in the Kansas City area.

Other traits from the Younkin mound do not have specific counterparts in the Kansas City Hopewell and have an extended chronological

[6] Wedel, 1943, pp. 40–1, 129, Pl. 8, *b*, and 37, *c*.

[7] Dentate stamping occurred at the Renner site, although usually arranged in alternate zone patterns. A vessel from the Renner mound exhibits dentate stamping in horizontal rows (*Ibid.*, pp. 40–1, 145, and Pl. 41, *a*).

[8] *Ibid.*, p. 32, and Table 2, p. 38.

[9] *Ibid.*, p. 40.

[10] *Ibid.*, p. 100.

[11] *Ibid.*, p. 82, Pl. 26, *f*.

[12] *Ibid.*, pp. 82–3, 143, Pl. 27, *h* and 40, *f*.

[13] *Ibid.*, p. 53, Pl. 13, *d*.

[14] *Ibid.*, pp. 105–45.

range in eastern United States. Examples of this class are the disc, *Marginella*, and conch columella beads. The presence of such traits in a Hopewellian context is not surprising, and their absence at the Renner site and in the stone burial enclosures may be due to disturbance and inadequate sampling. An alternative explanation, that these differences are due to divergent traditions, receives some support from the character of other artifacts from the Younkin mound.

If the ceramic features, the platform pipe, and the general character of the burial are subtracted from the trait list, the remaining complex suggests a pre-Hopewellian horizon of the type represented by Indian Knoll and other sites in the eastern area. The Archaic flavor is most strongly apparent in the long bone pins, although the specimens are by no means identical with those figured by Moore, Claflin, Webb, or Miller.[15] However, both types (flat, horizontally expanded head and head expanded in the vertical plane) were found in the Kentucky site.[16] Other traits suggestive of this horizon include paired curved shell pendants, worked human bone, and possibly inclusion of muskrat and other small animal bones in the deposit. In each case the comparable traits exhibit differences, and several other traits which are common to the two areas not only fail to correspond exactly, but also occur in various other horizons. In this category can be included cut animal jaws,[17] perforated turtle carapaces, worked deer phalanges, and bird bone beads. Numerous bird bone beads, and especially the abundance of incised specimens, appear to be a local feature at the Younkin site. Incised beads are present at Indian Knoll, but are exceedingly rare.[18] The remaining traits do not appear to be out of place in an Archaic horizon, with the exception of the delicately chipped points and the decidedly anachronistic bison rib beamers. The latter have been considered typical of historic Pawnee culture.[19] This situation recalls that of toothed bone fleshers, which occur in the Plains Woodland but do not reappear until protohistoric times.[20] Small stemmed points have been found on Woodland sites in Nebraska, and the resemblance between the Younkin and Steed-Kisker specimens is almost certainly without chronological significance

The Kansas City area provides a plausible background for the Hopewellian features of the Younkin complex, but the absence there of specifically Archaic traits leaves a remainder without explanation. This situation may indicate the existence on the Central Plains of a pre-Hopewellian horizon having definite eastern affinities. Occasional finds of boat stones in Nebraska[21] and southeastern Kansas[22] may be relevant in this connection. The Williams and Adams sites in Le Flore County, Oklahoma are of particular interest.[23] Here in refuse middens were found bone pins, boat stones, stone gorgets of various forms, and dog burials, all suggestive of an early Woodland or Archaic cultural level. In addition to this material pottery very similar to that described for the Ozark Bluff Dweller sites is reported.[24] Some of this pottery exhibits incised designs of Coles Creek type, which apparently gives an even more confused chronological picture.

A further consideration is the varied character of the manifestations assigned to the period of Woodland occupation in the Central Plains. This variability may be evidence of a relatively long duration for the period, with opportunity for repeated contacts to the east at various time levels. The receptiveness of the Central Plains to eastern influence in later periods lends some probability to the idea that representatives of the Archaic cultures also were established in the area during their long period of domination in the Southeast. If this was actually the case, the lower Republican and Oklahoma sites could be regarded as having preserved a portion of the Archaic tradition in spite of exposure to later influences. However, convincing evidence in the form of unmixed Archaic sites in the Plains has not been demonstrated, and an eastern derivation of the complexes as units cannot be ruled out, although this seems unlikely.

[15] Webb, 1946; Miller, 1941; Moore, 1916; Claflin, 1931.

[16] Moore, 1916, Fig. 8.

[17] The vertically bisected canine jaws of the Younkin mound seem to be distinctive and are of questionable comparative value. Collins (1941, p. 146) lists cut dog jaws as a Copell trait but does not describe the specimens in detail.

[18] Webb, 1946, p. 291, Fig. 43, D; Moore, 1916, Fig. 8. The specimen figured by Moore has crosshatching between pairs of rings, a technique not present at the Younkin site.

[19] Strong, 1935, p. 60.

[20] Hill and Kivett, 1941, p. 166.

[21] *Ibid.*, p. 218 and Pl. 19: 2.

[22] Private collections from Woodson and adjoining counties.

[23] Newkumet, 1940*a*, 1940*b*.

[24] Dellinger and Dickinson, 1942, pp. 280 and 283.

BIBLIOGRAPHY

CLAFLIN, WILLIAM H., JR.
1931. "The Stalling's Island Mound, Columbia County, Georgia." *Papers of the Peabody Museum of American Archaeology and Ethnology*, Vol. 14, No. 1. Cambridge.

COLLINS, HENRY B., JR.
1941. "Relationships of an Early Indian Cranial Series from Louisiana." *Journal of the Washington Academy of Sciences*, Vol. 31, No. 4, pp. 145–55. Washington.

DELLINGER, S. C., AND S. D. DICKINSON
1942. "Pottery from the Ozark Bluff Shelters." AMERICAN ANTIQUITY, Vol. 7, No. 3, pp. 276–89.

HILL, A. T., AND MARVIN KIVETT
1941. "Woodland-Like Manifestations in Nebraska." *Nebraska History*, Vol. 21, No. 3, pp. 143–243. Lincoln.

MILLER, REX K.
1941. "McKain Site, Dubois County, Indiana." *Prehistory Research Series*, Indiana Historical Society, Vol. 2, No. 1. Indianapolis.

MOORE, C. B.
1916. "Some Aboriginal Sites on Green River, Kentucky." *Journal of the Academy of Natural Sciences of Philadelphia*, 2nd Series, Vol. 16, Pt. 2, pp. 440–87. Philadelphia.

NEWKUMET, PHIL J.
1940*a*. "Preliminary Report on Excavation of the Williams Mound, Le Flore County, Oklahoma." *The Oklahoma Prehistorian*, Vol. 3, No. 2, pp. 2–6, 10. Oklahoma City.
1940*b*. "Excavation of Black Mound Reveals Ornate Hair Pins." *The Oklahoma Prehistorian*, Vol. 3, No. 2, pp. 8–9. Oklahoma City.

STRONG, WILLIAM DUNCAN
1935. "An Introduction to Nebraska Archeology." *Smithsonian Miscellaneous Collections*, Vol. 93, No. 10. Washington.

WEBB, WILLIAM S.
1946. "Indian Knoll, Site Oh 2, Ohio County, Kentucky." *University of Kentucky Reports in Anthropology and Archaeology*, Vol. 4, No. 3, Pt. 1, pp. 115–365. Lexington.

WEDEL, WALDO R.
1943. "Archeological Investigations in Platte and Clay Counties, Missouri." *Bulletin, United States National Museum*, No. 183. Washington.

Clay Center, Kansas

Museum of Anthropology
University of Michigan
Ann Arbor, Michigan

December, 1947

TWO HISTORICAL ARCHAEOLOGICAL PERIODS IN FLORIDA

HALE G. SMITH*

IN the past year through excavations of sites and examination of various collections, there have appeared elements in a late context that do not follow or conform to the archaeological traditions known for Florida up to this time.[1] On the east coast the collections of material excavated by W. J. Winter[2] gave us new data on the late period around St. Augustine and its cultural affiliations to the Georgia coast. This has been named the St. Augustine Period. In the excavation of a Spanish mission site[3] in Jefferson County by the Archaeological Survey of the Florida Park Service there appeared elements sufficiently different in time and content to name a new period the Leon-Jefferson.

Here follows a discussion and summary of the characteristics of the two periods.

* I am indebted to John M. Goggin and Gordon R. Willey for unpublished information regarding related pottery types. Mr. Goggin also supplied me with Joseph Caldwell's type descriptions of the King George series from the King George site. Information regarding the Castillo de San Marcos was given by Mr. Albert Manucy of the National Park Service. The plates were drawn by Mr. Andrew Janson of the Florida Park Service.

[1] Willey in his 1940 survey noted that certain historic sites in Leon and Jefferson Counties carried an aboriginal pottery tradition that differed from Ft. Walton and had late Georgia affiliations (Late Lamar).

[2] Winter conducted excavations for the National Park Service and the St. Augustine Restoration Society in various areas within the old city of St. Augustine including the moat at the Castillo de San Marcos.

[3] Smith, MS. 2. The site is located on the Scott Miller farm 26 miles southeast of Tallahassee, Florida.

ST. AUGUSTINE PERIOD 1565–1750

The city of St. Augustine and its subsequent fortifications have had a continuous occupation from its founding in 1565 until the present. Archaeological excavations under the direction of W. J. Winter in several areas of the town revealed a type of aboriginal culture that existed from prehistoric or protohistoric well up into historic times. The St. Augustine period is tentatively dated between 1565 and 1750. The moat at the Castillo was initially excavated in 1686 to a depth of 1.32 feet above mean sea level.[4] From this time until 1940 there was a gradual filling of the moat. In 1940 the moat was cleaned out to a depth of plus 0.94 foot above mean sea level. The aboriginal materials that came from the moat therefore carry the date 1686 or post 1686. This is most important as it gives us a definite date to associate with the aboriginal materials and provides one of the best absolute dates of this period in the Southeast at the present time. During the latter part of the seventeenth century the European and aboriginal cultures had been in contact, in this area, for several generations and there had been a certain amount of acculturation between the two groups.

The materials obtained from other excavations within the old city walls were of the same type as came from the moat. The cultural materials from the town sites and the moat included aboriginal, Spanish, British, and American materials. The artifact stratum in the town ran from the surface to a depth of 22 inches, with the heaviest concentration of Spanish and Indian materials occurring between 18 to 22 inches below the surface. For the most part, the aboriginal materials were at a depth of 20 to 21 inches, with the intermixed Spanish and aboriginal materials being from 18 to 20 inches below the surface. The aboriginal stratum of 20 to 22 inches may have been an Indian encampment immediately before or during the Spanish occupation. The type of ware seems to indicate that this stratum was a protohistoric, if not a fully historic, level. The location of the excavated sites seems to indicate that they were historic as they were away from the river or the beach where most of the prehistoric sites occur in this region. Test excavations immediately outside the old town wall failed to yield any aboriginal materials.

[4] From the engineer's files at the Castillo de San Marcos.

The 1750 date was arrived at very subjectively, being 13 years before the British occupation. It is believed that the aboriginal culture, what there was left of it, underwent a serious transformation (breakdown and further acculturation) during the middle 1700's. Whether this occurred immediately before or after the British occupation is still conjectural.

The predominating ware of the St. Augustine period is the San Marcos Stamped while St. Johns Check Stamped, an unnamed plain ware, an unnamed red filmed ware, and an unnamed incised ware made up minority groups.

A brief summary of the ware characteristics follows, annoted with their probable affiliations.

San Marcos Stamped (Pl. XXXI, *a–k*, *m–p*). The manufacturing technique was that of coiling. The paste is coarse grained, slightly contorted, and is tempered with small to abundant amounts of medium to large sized quartz sand and/or crushed limestone. The core color runs from gray to black. The interior surface is smooth but pitted due to gas bubbles escaping during firing and the leaching out of the tempering materials. The interior surface ranges in color from gray through tan to reddish buff. Occasionally the interior is painted orange with or without black painted lines. The exterior surface was scraped before the stamping was applied. The exterior pitting is not as extensive as the interior. The vessel was paddle marked with the design being composed of: (1) a combination of simple, check, and complicated design motifs appearing on one vessel (Pl. XXXI, *a*); (2) a combination of simple and check stamping (Pl. XXXI, *b*); (3) a combination of simple and complicated stamping (Pl. XXXI, *c*); (4) merely simple stamping (Pl. XXXI, *d*, *e*); (5) merely complicated stamping (Pl. XXXI, *f*, *h*); (6) merely check stamping (Pl. XXXI, *g*). These combinations were obtained either by the use of various paddles of different design motifs or by the inclusion of different design motifs on one paddle.

The simple stamping was the majority type from 1686 to 1750 at St. Augustine. It was generally carefully applied with little overlapping; the stamping was such that every other paddle impression runs at right angles to the adjoining impression, i.e., either vertically or horizontally to the rim. Often crossed stamping occurs, forming a series of in-line parallel nodes on the surface of the vessel. In the application

of the crossed simple stamping, the whole of the vessel may not be cross-stamped.

The check stamping appears alone on the vessel or is in association with other stamping techniques. The checks range from medium to large.

The complicated stamping is made up of a combination of rectilinear and curvilinear design motifs or else of purely curvilinear or rectilinear designs. The motifs are (1) concentric arcs (1/3 circle; Pl. XXXI, *f*,); (2) concentric circles with or without a raised interior dot (Pl. XXXI, *h*); (3) simple stamping with a square or circle in one corner (*ca.* 1 cm. square) having a raised inside dot (Pl. XXXI., *i*); (4) interlocking guilloche stamping (Pl. XXXI, *j*); (5) concentric rectilinear (diamond) designs, the interior diamond being composed of two parallel lines of medium checks (Pl. XXXI, *k*). The diamonds may also be bordered by check stamping.

The decoration occurs over most, if not all, of the vessel. The vessel forms run from small to large globular vessels and shallow bowls. The rim is slightly flaring or straight and may be folded. At the base of the fold there may or may not be punctations made with a blunt instrument or a hollow reed. (Pl. XXXI, *m*, *n*). Stamping occasionally occurs on the folded rim. The rims of shallow bowls occasionally are decorated with bold incising.

The geographic range of San Marcos Stamped in Florida, as known at the present time, is the St. Augustine region,[5] Ponte Vedra Beach,[6] the Higgs site[7] near Wabasso, Mexia's town of Nocoroco on the Tomoka Basin,[8] and the Fernandena area.[9] Certain similar elements are found in the Leon-Jefferson period. Moore[10] illustrates a San Marcos-like sherd of simple-stamped decoration from Walton's Camp on the northwestern Florida coast.

The Higgs site is a Spanish Colonial site that dates between 1675 and 1725 and occurs in the former territory of the Ais Indians. The San Marcos ware is in association here with Glades Plain and St. Johns Plain. The majority of the San Marcos sherds were of simple-stamped decoration. This fact, with what is known of the St. Augustine moat materials, gives a fairly close approximation of the time when simple stamping appears to have been the dominant type of decoration. The dating of the Higgs site was accomplished by the dating of Chinese porcelain, Spanish-Mexican ware, and English pipes manufactured by R. Tippet found in the excavation of the site.

The town of Nocoroco was relocated, by the use of Mexia's map made in 1605, on the point of the Tomoka Basin in Volusia County. The excavations established the fact that this was a historic site, as metal objects including a pair of scissors were encountered at the bottom levels of the village area. The few San Marcos sherds found were in association with a gritty and a chalky ware which made up the majority of the ware at the site. One sherd was decorated with fine punctations that made up a curvilinear design.

The San Marcos ware is very similar to King George Malleated that was found by Caldwell[11] at Ft. King George in Georgia. The King George Malleated is composed solely of simple stamping or malleating, characteristically applied in the crossed stamping technique. The Ft. King George site was occupied by the Huspaw Indians in 1715 and historic materials were found in association with aboriginal materials.

The archaeological period represented at Ft. King George is Late Lamar. These Late Lamar pottery traits are seen also in the San Marcos ware: the design motif, the forms, the rims, and the lip treatment. The combination of stamped body with a bold incised design on the rim of shallow bowls (Pl. XXXI, *o–p*) is typical Lamar as are the hollow reed punctations around the rim. So we postulate that the St. Augustine period is an extension of Late Lamar into northern Florida.

It should be noted that the distinctive crossed simple stamping is the dominant design motif at late sites (1686–1750): the moat of the Castillo, the Higgs Site, and Ft. King George. Sites that are known to have been earlier or are suspected to have been earlier have a large percentage of various complicated design motifs; these occur at various excavations in the town of St. Augustine and Nocoroco.

[5] Goggin in a personal communication reports San Marcos sherds as occurring on Anastasia Island.

[6] Goggin, personal communication.

[7] Higgs, 1942 and Smith, MS. 1.

[8] Site excavated by the Archaeological Survey of the Florida Park Service in 1947.

[9] J. W. Griffin reports one sherd of the simple stamped type as coming from this area. Goggin reports a San Marcos vessel that came from Fernandena. Personal communications.

[10] Moore, 1901, p. 453, Fig. 44.

[11] Caldwell, MS.

St. Johns Check Stamped. This type is present in small amounts. The typical form is found along the St. Johns River and in the northeastern coastal counties.

Red filmed ware. This is similar to the Kasita, King George, and Mission Red Filmed types,[12] and is only represented by a few sherds.

Plain and incised ware. This is of the same paste as the red filmed ware. The incised decorations are made up of deep broad Lamar-like lines (Pl. XXXI, *l*). The plain ware has flat- and round-bottomed shallow bowls and ollas. Strap handles are present. One aboriginal shallow bowl from the moat was of a black paste and had an olive-green glaze on the interior of the same type used on Spanish water, olive oil, and wine jars.

The aboriginal pottery was a strong cultural link between the Spanish and the Indians. In the various excavations and surface surveys of Spanish-aboriginal sites, Spanish cooking ware (not the water or olive jars) only occurs in abundance at the Higgs site with very few pieces present at St. Augustine. This suggests, since iron, copper, and brass kettles were not extensively used, that the Spanish took over the use of the Indian vessels.

LEON-JEFFERSON PERIOD 1650–1725

The aboriginal culture that is found at the Scott Miller site[13] and at other mission sites in the Tallahassee area, differs from the Ft. Walton period both as to time and content. This late culture has tentatively been dated as occurring from 1650–1725.[14]

The only sites where Leon-Jefferson types of aboriginal pottery have been found are historic. The aboriginal cultural complex that occurred at the excavated mission contained, aside from the pottery, these items:

Chert:

1. Small triangular projectile points.
2. Large triangular projectile points.
3. Large notched projectile points.
4. Small scraper with thick blunt scraping edge.

Limestone:

1. Discoidal stones (not "chunkie" stones).
2. Grinding or smoothing stones.
3. Awl sharpeners.

Granite:

1. Corn pounders.
2. Maul (fragment).

Quartz:

1. Smoothed pebbles.

Although this list seems quite extensive actually very few of these objects were found in numbers. The discoidal stones were the only aboriginal artifacts occurring in any great quantity (eleven of these were obtained). Pottery discs that averaged 1 inch in diameter were found.

The pottery complex for the Leon-Jefferson period is made up of Mission Red Filmed, Miller Plain, Aucilla Incised, Ft. Walton Incised, Ocmulgee Fields Incised, Lamar-like Bold Incised, Leon Check Stamped, Jefferson ware, Gritty Plain, and Alachua Cob Marked. This pottery complex shows influences from various areas and pottery traditions: strong Lamar influence and similarities in the complicated stamped ware to Late Swift Creek.

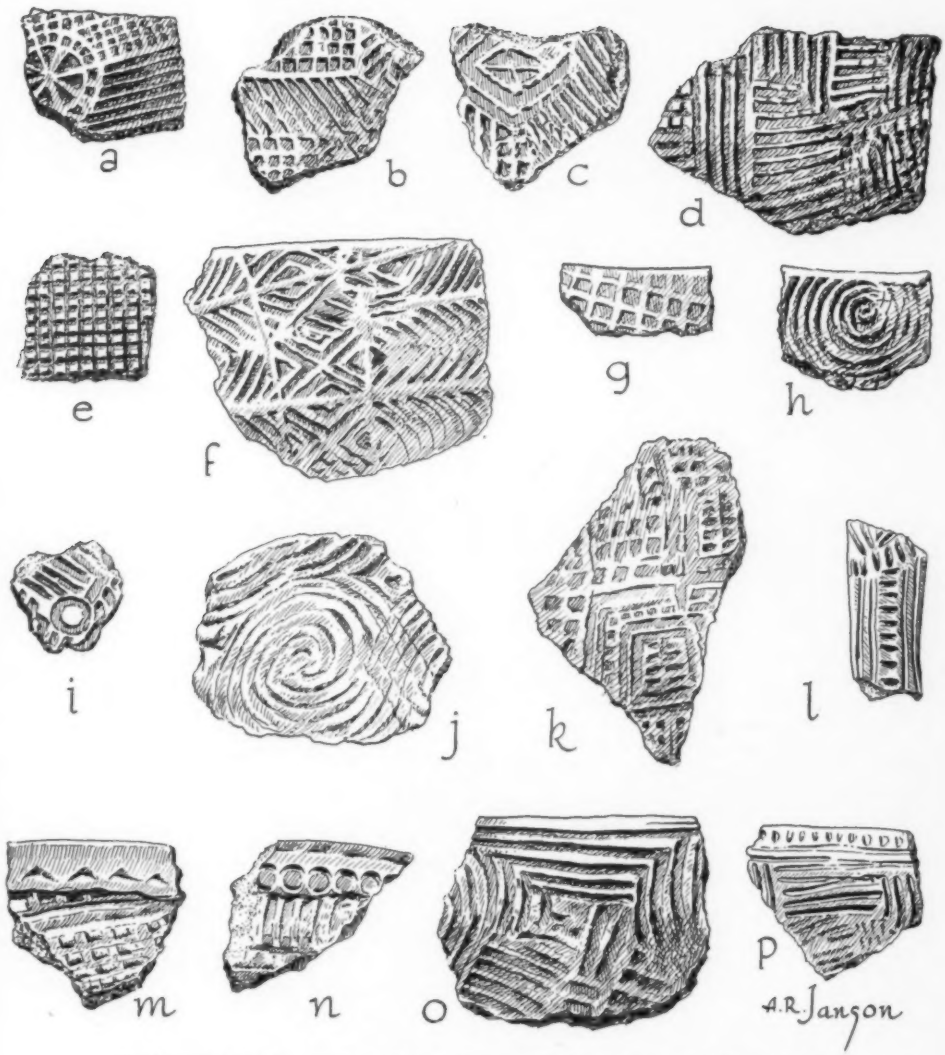
Mission Red Filmed. This ware is made up of plates whose interior surfaces are decorated by red zoned areas, and cups and small globular jars which have surfaces completely red filmed (these have a very high burnish). It is related to Kasita Red Filmed[15] but differs in that it has

[12] A Leon-Jefferson type.

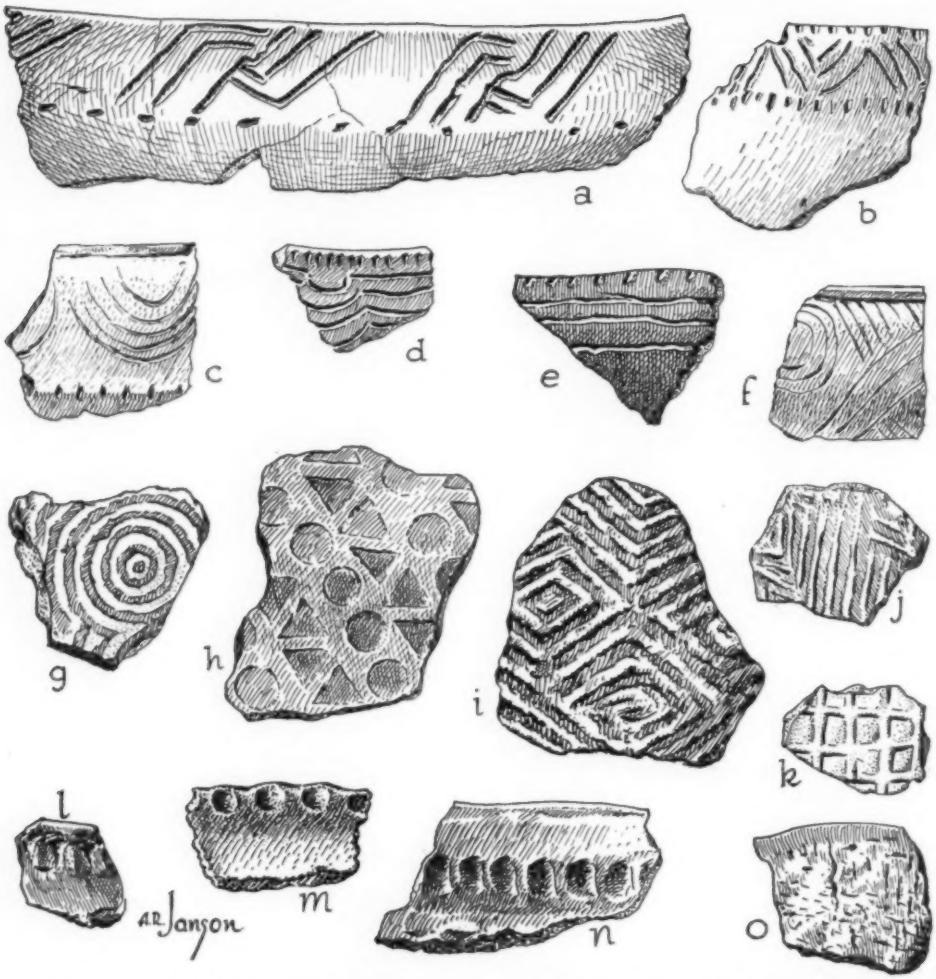
[13] The excavated mission had buildings constructed by the wattle and daub technique with hewn and split log framework and roof construction. The woodwork was secured by wrought iron nails. The mission complex was made up of two buildings and a borrow-refuse pit. The larger of the two structures was composed of two rooms with a surrounding patio wall. This complex measured 58 feet by 39 feet. The smaller building was probably an aboriginal abode, a stable, or some other minor building. This building measured 19 feet by 16 feet and did not have heavy construction or very high wattle and daub walls. Presumably most of this building was thatched. Some of the Spanish items were: olive-oil jar sherds, Hispano-Moresque ware (a glazed earthenware), glass bottle fragments, a spur rowel, a flintlock striker, a pistol barrel, a musket barrel, an ax, several spring locks, chest handles, hinges, hoes, a crucifix, an anvil, a finger ring, and various other metal artifacts.

[14] In 1633 the Franciscan monks began to establish a chain of missions from St. Augustine to the Apalachicola River. These were in full operation by 1650, hence our initial date (further research will probably extend this date back). In 1704 the Apalachee were almost totally destroyed by the raids of Colonel Moore of South Carolina. Those who were not killed or taken as slaves moved west to go under the protection of the French. What happened after 1704 in the Tallahassee area is conjectural. A mission list compiled by Benavides in 1732 indicates that some of the missions were still in existence. Whether they were in operation or in ruins is not known.

[15] Southeastern Archaeological Conference, 1940.



Sherd types of the St. Augustine period, northeastern Florida: *a–k*, *m–p*, San Marcos Stamped; *l*, incised strap handle.



Sherd types of the Leon Jefferson period, northwestern Florida: *a–d*, Aucilla Incised; *e*, Ft. Walton Incised; *f*, Ocmulgee Fields Incised; *g–i*, *l–n*, Jefferson ware; *k*, Leon Check Stamped; *o*, Alachua Cob Marked.

a larger amount of tempering matter in the paste admixture and is a harder ware with some sherds having a high reflecting surface. Mission Red Filmed has the plate, with an annular ring type of base, as its principal form, while Kasita Red Filmed is made up predominantly of flattened, shallow globular vessels with flaring rims. The core of Mission Red Filmed is always black, while in the Kasita Red Filmed it is buff to light brown or gray. The zoning technique of the Mission Red Filmed occurs only on plates, while the Kasita Red Filmed has zoning on other vessel forms. This type is also similar to the red filmed ware of the St. Augustine period. It is evident that the St. Augustine Red Filmed, Mission Red Filmed, King George Red Filmed, and Kasita Red Filmed are genetically related.

Miller Plain. This ware has forms which are Middle Mississippian-like and show a marked similarity to the Ocmulgee Fields and the Kasita Red Filmed forms which date 1675–1725 in Georgia. The shallow bowl form has incurved, straight, or flaring rims; flat or rounded lips; rounded, flat, or annular type of base. No appendages were found. This shape is the majority form. The plate, small mouthed water bottles, *cazuelas*, lugged shallow bowls, and pitchers (pitcher handles were found that were of European design rather than aboriginal) make up the minority forms. The paste was well mixed, compact, and slightly contorted, being tempered with fine sand and grit in moderate to small amounts. The hardness is between 4.5 to 5.

Aucilla Incised (Pl. XXXII, *a-d*). These sherds differ in the type of decoration from those in the Ft. Walton Incised tradition. The designs are similar to the incising found on Lamar ware in Georgia and also show some correlation (temporally and stylistically) to Pinellas Incised ware from the Tampa area.[16] This type is only represented by a few sherds at the mission. The paste is well mixed and compact, the core is black, with both surfaces finely scraped and smoothed. The shallow bowl and *cazuela* are the only forms represented. The majority of the rims are incurved, while the lip is either flat or rounded. Lip lugs occurred on two of the sherds. The base was probably rounded. The hardness ranges from 4 to 5. The decoration is composed of two to five parallel lines, which may or may not dip to form a loop design encircling the rim of the vessel; chevron designs and various other rectilinear and curvilinear designs, which may or may not have the background filled by punctates, also occur. Punctates are usually below the lip.

Jefferson ware. This is made up of a plain ware and of pottery decorated with four distinct types of complicated stampings, with or without a punctated and folded rim. The paste is compacted with laminations occurring along the vessel wall in some cases. The color of the core runs from gray through buff and browns to black. The paste is tempered with small to abundant amounts of prepared grit and sand with occasional use of coarse quartz sand or sherd tempering. Both surfaces are smoothed by scraping. The hardness ranges from 3.5 to 5. The complicated stamped Type A decorative motif is made up of a pattern of from three to five concentric rectilinear impressions (Pl. XXXII, *i*). Overlapping occurs to some extent. The designs range in application from clear to hardly discernible. The central diamond may be open or closed, and occasionally a raised circle replaces the diamond. The Type B design is composed of concentric circles with raised dot centers (Pl. XXXII, *g*). The Type C design is a pattern of triangles and circles: equilateral triangles either base to base or occurring side by side surrounded by circles or oval-sided design elements (Pl. XXXII, *h*). The type D motif is a herringbone decoration (Pl. XXXII, *j*). The vessel form is that of an elongated globular vessel.

The Jefferson pinched or punctated rim (Pl. XXXII, *l-n*) has affiliations to both the Lake Jackson Plain[17] and Pinellas Plain,[18] as described by Willey. The Lake Jackson Plain is in an earlier period than the Jefferson ware. The Pinellas Plain is historic in the Safety Harbor horizon and probably has a closer correlation to the Jefferson ware than either have to the Lake Jackson Plain. The Jefferson complicated stamped types have a strong correlation with the Late Lamar stamped ware of Georgia and have similarities to the Late Swift Creek types. Type A is similar in design motif to St. Andrews Complicated Stamped, which is a Late Swift Creek type of the Weeden Island period, and to Late Lamar Stamped. Type B is similar in design motif and paste to a Lamar stamped and a Late Swift Creek stamped of the Tampa area.[19] Type C is a degenerate Weeden Island-

[16] Willey, personal communication.

[17] Willey and Woodbury, 1942, pp. 245–6.

[18] Willey, personal communication.

[19] Willey, personal communication.

like complicated stamped and is represented by only seven sherds. Type D is like the Crooked River Stamped ware, which is a Late Swift Creek type. It is represented only by fourteen sherds.

Although it appears now that there is a time break after the almost total disappearance of stamped ware in Florida at the end of the Weeden Island period, there is the possibility that there was a continuum of the Swift Creek tradition which did not die out entirely in the northwest Florida coast region. Moore[20] mentions complicated stamped ware being found on Bear Point on Perdido Bay, Alabama. This site is of the Ft. Walton period, where many European trade articles were found. The complicated stamped sherds came from the top few inches of this site. Whether this is a Late Lamar or a Late Swift Creek-like type is unknown. Late Lamar probably came into northern Florida during the latter part of the Ft. Walton period, after Lake Jackson times, and made up a large part of the pottery tradition from *ca* 1625–1725.

Ft. Walton Incised (P. XXXII, *e*),[21] Ocmulgee Fields Incised (Pl. XXXII, *f*),[22] Lamar-like Bold Incised,[23] Leon Check Stamped (Pl. XXXII, *k*),[24] and Alachua Cob Marked (Pl. XXXII, *o*)[25] have been, or soon will be, described in the literature. The Leon Check Stamped has to date been found only in Leon and Jefferson counties, but it does show a close correlation to the check stamping on the San Marcos ware. The Alachua Cob Marked has also been found in the Gainesville region.[26] A probable related type of cob marking occurs at the Lake Jackson site north of Tallahassee.[27] The Ft. Walton Incised sherds are only present there in small numbers. The Ocmulgee Fields Incised was represented by eleven sherds, while only two Lamar-like Bold Incised were found.

SUMMARY

Both of the periods discussed above represent a time of shift and change in an aboriginal culture whose people were under the surveillance of the Spanish. It is to be assumed that the Indians living at or near the missions or St. Augustine would initially adopt those European artifacts which would replace or supplement similar items of their aboriginal culture. Later, as the Spanish influence became more pressing, the purely aboriginal cultures were changed on the physical, social, and religious levels through missionary work and the amount of acculturation occurring between the two groups. That the latter changes took place in the late sites is indicated by the fact that the aboriginal material culture (archaeological evidence thereof) was composed almost solely of pottery traits. As has been noted earlier, the Spanish undoubtedly helped to keep this aspect of the culture functioning, for they themselves made use of aboriginal vessels. The Spaniards, unlike the British and the French, did not possess or use for trade purposes the great amount of metal kettles, buckets, etc., that are found in historic aboriginal sites of areas formerly under British and French control.

The groups of people, with their material culture, who were present during the two Florida periods must have been heterogenous, especially in the St. Augustine region, for during the construction of St. Augustine and the Castillo de San Marcos Indians were brought in from the surrounding areas to do the actual work. Before the British occupied Georgia, the Spanish maintained a mission chain up the Georgia coast in the province of Guale. At this time or slightly before, the Late Lamar culture was established in the latter area and diffused to St. Augustine, where it was the dominant ceramic type. What actual Georgia groups carried this culture is unknown. Slightly later the Apalachee, and probably also the Timucua, were required to send laborers to St. Augustine for construction work. There are also reports of the Ais going occasionally to the fort to trade with the Spaniards.

The various groups making up the Apalachee confederacy are also unidentified, but it is known that the Oconee of Georgia had divided, one group going to the Georgia coast and the other joining the Apalachee. Since the Oconee are related to the Kasita, both being Hitchiti, this may explain the similarity among the Kasita Red Filmed, the Mission Red Filmed, and the red filmed ware found at St. Augustine. The latter two were probably derived from the Kasita Red Filmed and King George Red Filmed. The Oconee may have been the pur-

[20] Moore, 1901, p. 430.

[21] Willey and Woodbury, 1942, p. 244.

[22] Southeastern Archaeological Conference, Vol. I, No. 2, 1939.

[23] *Ibid.*

[24] Willey, personal communication.

[25] Goggin, personal communication.

[26] *Ibid.*

[27] J W. Griffin and Goggin, personal communications.

veyors of the Mission Red Filmed among the Apalachee. The western, Late Lamar ceramic types which came into the Apalachee area were from a center peripheral to the Ocmulgee Fields, Macon area, which influenced northern Florida and southeastern Alabama.[28]

When the functioning and interrelationships of the aboriginal traits, mainly ceramic, of the late horizons are established and understood, it should be possible more fully to understand the prehistoric cultures. In the prehistoric horizons the various cultures involved were on more or less the same technological and sociological plane, but with the coming of the European culture the changes were of a different nature. Further work in the late sites of northern Florida, southern Georgia, and Alabama will clear up many of the problems that are now unsolved and give a clearer insight into the various changes which the prehistoric cultures underwent when brought into contact with European cultures.

[28] Personal communication with Wesley R. Hurt, who conducted a survey of southeastern Alabama during the summer of 1947.

BIBLIOGRAPHY

CALDWELL, JOSEPH
MS. "Report on the Ft. King George Site," Manuscript on file in the University of Chicago, Chicago Illinois.

HIGGS, CHARLES D.
1942. "Spanish Contacts with the Ais (Indian River) Country." *The Florida Historical Quarterly*, Vol. 21, No. 1, pp. 25–39. Tallahassee, Florida.

MOORE, CLARENCE B.
1901. "Certain Aboriginal Remains of the Northwest Florida Coast." *Journal of the Academy of Natural Sciences*, Second Series, Vol. 11, Part 4. Philadelphia.

SMITH, HALE G.
MS. 1. "Preliminary Report on Two Archaeological Sites in Brevard County, Florida, Excavated During the Summer of 1946." Manuscript on file at the Archaeological Survey of the Florida Park Service, Highland Hammock State Park, Sebring, Florida.
MS. 2. "An Archaeological Excavation of a Spanish Mission Site in Jefferson County, Florida." *Ibid.*

SOUTHEASTERN ARCHAEOLOGICAL CONFERENCE
1939. *News Letter*, Vol. 1, No. 2. Lexington: University of Kentucky, (Mimeographed).
1940. *News Letter*, Vol. 2, No. 2. Lexington: University of Kentucky. (Mimeographed.)

WILLEY, GORDON R., AND R. B. WOODBURY
1942. "A Chronological Outline for the Northwest Florida Coast." AMERICAN ANTIQUITY, Vol. 7, No. 3, pp. 232–54.

Florida Park Service
Sebring, Florida
December, 1947

FACTS AND COMMENTS

THE FACTS CONCERNING THE CLEAR FORK CULTURE

In writing an article for scientific publication one preferably should have done some original research in that field, or if his disposition is such that he wishes to criticize the work of those who have spent decades in methodical observations in regions different from his own, he should have made a real effort to ascertain the facts before going into print. In the writer's opinion, Dr. Kelley's article on the Clear Fork culture in a recent issue of AMERICAN ANTIQUITY[1] does not measure up to these criteria.

The writer has studied the Clear Fork culture for over twenty years. He published pictures of five Clear Fork gouges in Volume 1, 1929, of the Texas Archeological and Paleontological Society *Bulletin*.[2] In Volume 2, 1930, of the same *Bulletin* he illustrated artifacts from the McLean and the Gibson sites, both of which contain Clear Fork and other ancient types of artifacts.[3] In 1929 and 1930, excavation in these sites was done by the writer assisted by E. B. Sayles and others. Sayles left Abilene in 1931 and returned for a few months in 1934, when his employers sent a geologist, M. M. Leighton, to Abilene. Leighton made a report in 1936 on the writer's sites. He simply divided thirty or more feet of river silts into two parts, the so-called Elm Creek and the Durst silts.[4] All of the previous excavation in the Nugent or so-called Elm Creek silts had been done under the writer's direction near Nugent, Texas, in 1929; also all of the early excavation in the Clear Fork or so-called Durst silts had been done under the writer's direction in 1930 at the Gibson site. Pictures of both excavations were published in the 1930 Texas *Bulletin*, and the discoveries were reported in *Science-News Bulletin* for 1929.[5]

Subsequently, the writer was able to distinguish a sequence of seven layers of silts: Lower Clear Fork, Upper Clear Fork, and Nugent 1–5. Kelley's statements, on pages 98 and 99 of his article,[6] that "Ray presents no reason for this reclassification" are inaccurate. On the contrary, the writer devoted the first two pages—117 and 118 of "Stream Bank Silts of the Abilene Region"—to a discussion of his rights of discovery, and other reasons for describing the silts as nature formed them.[7] Hereafter when bones or artifacts are found imbedded in river silts, their placement in one of these seven natural silt strata means something definite and scientific in time sequence, while placement in the 25 feet of so-called Elm Creek silts can mean almost anything. This writer has never at any time named, or renamed, the discoveries of any other person; but when the writer had acquired sufficient knowledge of the subject, after eighteen years of intensive study, he named the seven occupied silts which he had discovered, and which he had during the years of 1929–30 been the first person to describe in print.

The charge of renaming without any reason comes with bad grace from one who renamed nearly all of the artifacts he discussed in his paper in AMERICAN ANTIQUITY, the said paper being full of references to unfamiliar names which it would seem are old friends under new designations. What looks suspiciously like a Pinto Point, shown by Kelley, is termed a "Pedernales Indented Base," a type shown by Wilson in 1897 as a Bifurcated Stem variety.[8] The picture is not good, but the three points listed by Kelley as components of the Clear Fork culture, called Darts 1, 2, and 3, and also named under other designations, have very little real resemblance to the Clear Fork types he states they are, and this writer rejects the classification.

In view of the epidemic of renaming artifacts previously described and named by others, which seems to be in progress at Texas University, the people there should not complain at the alleged renaming of a few buried sites by their own discoverers.

The inference of Kelley's statement on page 97[9] that he visited the writer in 1942 "to ascertain the facts" is misleading. He was only in Abilene a few hours, saw very few Clear Fork sites, and has not conferred with the writer to any appreciable extent. That some persons have found occasional Clear Fork gouges and dart heads, and also Folsom and Yuma blades, mixed in late culture complexes, may be quite true and rationally explainable without the necessity of envisioning a late pottery-horizon survival of either Clear Fork, Folsom, or Yuma cultures.

Almost all of the conclusions of Kelley's paper are inaccurate for the reason that they are based on the finding of a few stray artifacts of older cultures which either were washed out of lower levels higher up on the streams and redeposited lower down in pottery middens, or were found on old sites by recent Indians and carried into the sites as curios. That Dr. M. M. Leighton wrongly evaluated an earlier Pleistocene remnant at the Young site,[10] containing many mammoth bones, as of the same age as the Nugent silts, and then wrongly classified the Nugent or so-called Elm Creek silts as Pleistocene is no discovery of Kelley's, but this fact was first proved, documented, and illustrated by this writer in the 1944–45 Texas *Bulletin*.[11] The writer found all of the numerous mammoth bones of the Young site in the Hawley gravel, and he is quite certain that the latter is far older than any of the Nugent, or so-called Elm Creek, and the Clear Fork, or so-called Durst silts.

To the present time the writer has found bones of mammoths embedded in the base of the Lower Clear Fork silt, both at the McLean site, and at the Gibson site. At the McLean site, Folsom, Yuma, and Gibson points were found embedded at the mammoth level in Lower Clear Fork silt. At the Gibson site Abilene points, Jones points, and

[1] Kelley, 1947.
[2] Ray, 1929*a*, pp. 18–19, Pl. 1, bottom panel.
[3] Ray, 1930, pp. 45–52, Pls. 10, 11, 14, 15.
[4] Leighton, 1936.
[5] Ray, 1929*b*.
[6] Kelley, 1947, pp. 98–9.
[7] Ray, 1944–45.
[8] Wilson, 1899, pp. 935–6, Pl. 38, Fig. 11.
[9] Kelley, 1947, p. 97.
[10] The Hawley gravel.
[11] Ray, 1944–45.

one Gibson point were found deeply buried in the Lower Clear Fork silt. The Gibson point found there has been classified by some as a variant of the Folsom point.

The Upper Clear Fork silt at the Gibson site is represented only by an 8- to 10-inch thick stratum of the basal portion of that silt; the rest of the upper portion has been eroded away. Man-made flint flakes, hearths, and worked flints are all through this, but are especially concentrated on top of the old Lower Clear Fork land surface and in the bottom of the Upper Clear Fork stratum. Whole Clear Fork darts have been found at the base of the Upper Clear Fork stratum, or near the line between the two silts; one was found by the writer in June, 1941. Another Clear Fork dart head was found late in October, 1945 by Dr. C. H. Webb of Shreveport, Louisiana, and this was witnessed by Mrs. Webb, Mrs. T. L. Hodges of Bismarck, Arkansas, her car driver, and the writer and his wife, a total of six persons. In late August of 1947, Dr. Carl Sauer, Dr. S. F. Cook, and a geological assistant, all of the University of California, visited the Gibson site and found an additional Clear Fork dart head, which find was also witnessed and photographed by the writer while it was still embedded in place in the creek bank.

Many of the deeper level, Lower Clear Fork finds have been witnessed by from three to four persons each, including the following: E. B. Sayles, Dr. Otto O. Watts of Hardin-Simmons University, Dr. Clifford Jones, then President of Texas Technological College, Dr. W. C. Holden of Texas Technological College, Dr. Kirk Bryan of Harvard University, Samuel Vaughan of Harvard, and E. J. Gardiner of Texas University. In the light of the fact that numerous reliable persons have witnessed the finding of the Clear Fork culture dart heads, embedded in the base of the Upper Clear Fork silt and at or near the line of juncture of the Upper and Lower Clear Fork silts, there can be no question as to the age of the culture.

In addition to the regular sequence of seven river silts, there is a comparatively recently formed eighth silt, which has neither been previously described nor named, and which will herewith be termed for descriptive purposes the Ft. Griffin silt, because of its frequent occurrence in that region.

At various places along the rivers of Texas, sections of whole river banks were washed away, probably during the period of heavy floods which occurred near the end of Nugent Silt 4 times, when a black humus band was formed which contains more hearth debris than at any other level. These sections were subsequently refilled to depths of 30 to 35 feet with a dark-colored, unstratified, amorphous silt deposit. This refilling occurred within a comparatively short space of time, beginning not earlier than the end of the Nugent Silt 4 period and continuing throughout Nugent Silt 5 times until this most recent Ft. Griffin silt had filled in the river-bank gaps up even with the top of the seven ancient silts, which lie in regular sequence in places where the erosion and redeposition has not occurred. While the Ft. Griffin silt filled in rapidly as geological time is counted, it was built up slowly enough so that men of recent pottery-making cultures lived on the banks, and left their remains. Conceivably Clear Fork gouges which occurred down near the bottom of a regular silt sequence could have been washed out of Clear Fork silt, at some place higher up stream and have been redeposited lower down the stream high up inside a pottery site. At any rate the writer visited the Harrell site at South Bend while it was being excavated by Texas University, and it consisted of a recently filled-in, unstratified, amorphous deposit of Ft. Griffin silt.

According to the University of Texas report of the Harrel site, an area 135 by 85 feet was excavated to depths of 5 to 10 feet. In this large area only five gouges were found. The excavators found one gouge at a depth of 1 foot, one at 2 feet, one at 3 feet, one at 4 feet, and one at 6 feet. Also, they found one Puebloan potsherd dated at 1450 A.D. and therefore concluded that the five Clear Fork gouges and the Puebloan sherd were of the same age.

Kelley claims in his article that there are no pure sites of the Clear Fork culture in the region he has studied. It might be a good idea to study a culture where it occurs in pure culture sites to the number of hundreds of sites before coming to definite conclusions about it.

The writer has recently transferred a personal collection of 16,500 flint tools, a large proportion of them Clear Fork artifacts, to Texas Technological College. In no instance has he ever found any potsherds of any sort in a pure Clear Fork site. Pottery does not occur in the regular river-silt sequence of deposits below the upper part of the top silt, or the top of Nugent Silt 5, and usually not much, if any, below plow depth. There is no known instance of pottery being found in any of the other six silts of the regular sequence. A depth of 25 feet separates Clear Fork culture deposits from pottery cultures in all regularly deposited river-silt sequences of the region.

While the Clear Fork culture flints are found on the top surface of the Lower Clear Fork silt, and in the base of the Upper Clear Fork silt, other similar cruder percussion flaked types and Folsom points are found throughout the lower Clear Fork silt to a thickness of six or more feet below the juncture, and this lower silt definitely contains some mammoth bones. Evidently the Clear Fork culture evolved out of the Abilene complex late in Lower Clear Fork times. The writer would set the time of use of the Clear Fork culture at about the close of the Pleistocene.

The Abilene, Yuma, Folsom, Jones, and Gibson artifact types are definitely late Pleistocene in age. The Clear Fork culture began at about the end of the Pleistocene, probably lasted several thousands of years, and ended during the deposition of the upper Clear Fork silt. There are from 20 to 25 feet of Nugent silt deposits over it, and probably 20,000 or more years of time have elapsed between the latest deposition of Clear Fork artifacts and those of the pottery-using Indians who lived on the present-day top surfaces of the same streams' banks. No proof has been found that pottery and Clear Fork sites were ever near to the same position in the regular sequence of river silts where they have been studied.

BIBLIOGRAPHY

BRYAN, KIRK

1938. "Deep Sites near Abilene, Texas." *Bulletin of*

the Texas Archeological and Paleontological Society, Vol. 10, pp. 273–6. Abilene.

BRYAN, KIRK, AND CYRUS N. RAY
1938. "Long Channelled Point found in Alluvium beside Bones of *Elephas Columbi*." *Ibid.*, Vol. 10, pp. 263–8. Abilene.

KELLEY, J. CHARLES
1947. "The Cultural Affiliations and Chronological Position of the Clear Fork Focus." AMERICAN ANTIQUITY, Vol. 13, No. 2, pp. 97–109.

KRIEGER, ALEX D.
1946. "Culture Complexes and Chronology in Northern Texas." *University of Texas Publications*, No. 4640. Austin.

LEIGHTON, M. M.
1936. "Geological Aspects of the Finding of Primitive Man near Abilene, Texas." *Medallion Papers*, No. 24. Globe, Arizona: Gila Pueblo.

MASON, J. ALDEN
1929. "The Texas Expedition." *The Museum Journal, Museum of the University of Pennsylvania*, September–December 1929, Pl. XLII. Philadelphia.

RAY, CYRUS N.
1929*a*. "A Differentiation of the Prehistoric Cultures of the Abilene Region." *Bulletin of the Texas Archaeological and Paleontological Society*, Vol. 1, pp. 7–22. Abilene, Texas.
1929*b*. "News of Ancient Man Reported from Texas." *Daily Science News Bulletin*, Dec. 10, 1929. Washington.
1930. "Report on Some Recent Archeological Researches in the Abilene Section." *Bulletin of the Texas Archaeological and Paleontological Society*, Vol. 2, pp. 45–58. Abilene.
1934*a*. "Flint Cultures of Ancient Man in Texas." *Ibid.*, Vol. 6, pp. 107–11, Pl. 18. Abilene.
1934*b*. Editor's Note attached to "The Archeology of The Southwest and its Relation to the Cultures of Texas," by Harold S. Gladwin, *Ibid.*, Vol. 6, pp. 35–6. Abilene.
1935. Editorial: "Folsom Sites." *Ibid.*, Vol. 7, pp. 127–9, Pl. 17. Abilene.
1936. Editorial: "New Data on Deeply Buried Sites." *Ibid.*, Vol. 8, pp. 189–96. Abilene.
1937. "More Evidence Concerning Abilene Man." *Ibid.*, Vol. 9, pp. 193–221. Abilene.
1938*a*. "The Clear Fork Culture Complex." *Ibid.*, Vol. 10, pp. 193–207. Abilene.
1938*b*. Editorial: "Deep Sites Near Abilene, Texas." *Ibid.*, Vol. 10, pp. 273–6, Pl. 37. Abilene.
1939*a*. "Some Unusual Abilene Region Burials." *Bulletin of the Texas Archeological and Paleontological Society*, Vol. 11, pp. 226–50. Abilene.
1939*b*. "Is the American Mano of Pleistocene Age?" *Ibid.*, Vol. 11, pp. 251–2. Abilene.
1940*a*. "Was the American Mano and Metate an Invention made during Pleistocene Time?" *Science*, Vol. 91, No. 2356. New York: Science Press.
1940*b*. "The Deeply Buried Gibson Site." *Bulletin of the Texas Archeological and Paleontological Society*, Vol. 12, pp. 223–37, Pls. 40–42. Abilene.
1941*a*. "The Various Types of Clear Fork Gouges," *Ibid.*, Vol. 13, pp. 152–62, Pls. 27–28. Abilene.
1941*b*. "Another Type of Gibson Site Point." *Ibid.*, Vol. 13, p. 177. Abilene.
1942*a*. "Prehistoric Paintings covered with Staligmitic Deposit." *Ibid.*, Vol. 14, pp. 49–60. Abilene.
1942*b*. "Transparent Calcium Incrustation Over Rock Paintings." *Science*, Vol. 96, No. 2497. New York: Science Press.
1942*c*. Editorial: "Ancient Artifacts and Mammoths' Teeth of the McLean Site." *Bulletin of the Texas Archeological and Paleontological Society*, Vol. 14, pp. 137–46, Pls. 30–36. Abilene.
1943*a*. "A Texas Skeleton." *Science*, Oct. 15, 1943, New York: Science Press.
1943*b*. Editorial: "Human Burial Covered by Twenty-one Feet of Silt." *Bulletin of the Texas Archeological and Paleontological Society*, Vol. 15, pp. 110–16, Pls. 17–18. Abilene.
1944–45. "Stream Bank Silts of the Abilene Region." *Ibid.*, Vol. 16, pp. 117–47, Pls. 20–27. Abilene.
1946*a*. "Permian Polished Boulders of Texas." *Ibid.*, Vol. 17, pp. 63–83, Pls. 14–19. Abilene.
1946*b*. Editorial: "Scientists Inspect Ancient Hearths in River Silts." *Ibid.*, Vol. 17, pp. 104–7, Pls. 23–24. Abilene.

RAY, CYRUS N., AND KIRK BRYAN
1938. "Folsomoid Point found in Alluvium." *Science*, Vol. 88, No. 2281. New York: Science Press.

RAY, CYRUS N., AND E. B. SAYLES
1941. Editorial: "An Agreement on Abilene Region Terminology." *Bulletin of the Texas Archeological and Paleontological Society*, Vol. 13, pp. 175–6. Abilene.

ROBERTS, F. H. H., JR.
1940. "Developments in the Problem of the North American Paleo-Indian." In "Essays in the Historical Anthropology of North America," *Smithsonian Miscellaneous Collections*, Vol. 100, pp. 51–116. Washington.
1945. "A Deep Burial on the Clear Fork of the Brazos River." *Bulletin of the Texas Archeological and Paleontological Society*, Vol. 16, pp. 9–30. Abilene.

SAUER, CARL O.
1947. "Early Relation of Man to Plants." *The Geographical Review*, Vol. 37, pp. 1–25. New York.

WILSON, THOMAS
1899. "Arrowpoints, Spearheads, and Knives of Prehistoric Times." *Annual Report of the U. S. National Museum* for 1897, Pt. 1, pp. 811–988 Washington.

CYRUS N. RAY
Texas Archeological and
Paleontological Society
Abilene, Texas
December, 1947

LINE DRAWINGS FROM UNSATISFACTORY PHOTOGRAPHS

Conventional methods of making line drawings from photographs not suitable for reproduction consist, in general, of inking in desired features on a large print of the photograph, usually blue, and then bleaching out the photographic image. This procedure, which gives good results in skilled hands, produces a line image consisting only of the applied ink lines, which are usually somewhat degraded because the paper fibers are displaced ("exploded") by the chemical action of the bleaching solution. This same chemical action makes difficult additional ink work after bleaching.[1]

High-contrast films developed during the last decade make possible several simplifications of this procedure. When the ink work on a blueprint is satisfactory (as determined by viewing through a deep blue filter), the print, as is, may be sent to the engraver, with instructions to "drop out the blue," which he does by using a high contrast "color blind" emulsion, such as Kodalith.

Where many prints are desired, the inked blueprint may be copied on "color blind" film, or panchromatic film with blue lighting or a blue filter. When properly copied, prints from the resulting negative will include only the ink lines added to the blueprint.

When a fine paper surface is necessary for proper inking, the desired image may be printed on a suitable photographic paper, the resultant image toned a convenient color, such as red or blue, by any convenient process, and the ink work added. The background image is then dropped out by use of panchromatic film and a filter of the same color as the unwanted image.

This procedure is superior to the older bleaching process because the quality of the inked lines is not altered by the chemical and mechanical disturbances of the paper structure caused by the bleaching process.

RONALD L. IVES
Department of Geography
Indiana University
Bloomington, Indiana
October, 1947

AN ASTRONOMICAL TEST OF CASO'S CORRELATION

"La Correlación de los Años Azteca y Cristiano" by Alfonso Caso, *Revista Mexicana de Estudios Antropologicos*, Vol. 3, pp. 11–45, Mexico, 1939, may be tested by means of some astronomical data. For this purpose, sources are supplied.

Paul Radin, "The Sources and Authenticity of the History of the Ancient Mexicans," *University of California Publications in American Archeology and Ethnology*, Vol. 17, No. 1, Berkeley, 1920 (Codex Telleriano-Remensis, Part 4, pp. 45–50):

P. 46, Pl. 5, "In the year 12 *rabbit* (1426 A.D.) . . . there was an eclipse of the earth(?)."

P. 47, Pl. 15, "In the year 10 *flint* (1476 A.D.) . . . there was an eclipse of the sun."

P. 48, Pl. 22, "In the year 4 *knife* (1496 A.D.) . . . there was a great eclipse of the sun."

T. von Oppolzer, "Canon der Finsternisse," Vol. 52, Vienna, 1887, provides the following data:

6269	1426	X 30	2242207	18^h	30.1^m
6380	1477	II 13	2260576	19	32.7
6423	1496	VIII 8	2267692	20	39.0

Based on tables of Paul V. Neugebauer, in *Astronomische Chronologie*, Vol. 2., Leipzig, 1929, the local time and the magnitude of the eclipses for Mexico City, or Tenochtitlan, at 99° 7′ W. Long., 19° 26′ N. Lat., are computed.

1426	X 30	11.52 a.m.	0.78
1477	II 13	1.56 p.m.	0.89
1496	VIII 8	3.08 p.m.	Total

In order to check Caso's correlation with the solar eclipse of February 13, 1477, some dates are adapted to his system of equation.

2 Quiahuitl	1 Izcalli	1476	II	5	(year began)
10 Tecpatl	20 Tititl	1477	I	29	(10 Tecpatl)
3 Cuetzpalin	1 Izcalli	1477	II	4	(year began)
11 Calli	20 Tititl	1478	I	29	(11 Calli)

According to this method of correlation, the annular eclipse of February 13, 1477, that approximated nine-tenth totality at Tenochtitlan, fell not in the Codex year 10 Tecpatl (*flint*) but in Caso's year 11 Calli.

R. B. WEITZEL
Washington, D. C.
October, 1947

A WEST INDIAN AX FROM FLORIDA*

A stone ax of West Indian type is included among the collections from north Florida in the Florida State Museum (cat. no. 3535). In view of the ever-interesting question of Antillean-Floridian relationships, this specimen seems worth considering in some detail.

Information in the Florida State Museum catalog indicates that the ax was received in 1914 from A. W. Sargent of Gainesville who found it on the surface near Newnan's Lake, Alachua County. This is about five miles east of Gainesville. It was accompanied by the base of a spearhead, an arrowhead, and a sherd of St. Johns Check Stamped pottery (cat. nos. 3536–3538).

The ax has a roughly rectangular blade; shallow, grooved neck; and broad butt, with a large ear-like projection on either side of the butt and a pair of smaller ones on top (Fig. 55). In cross section, one side is strongly convex and the other partially flattened, so that the artifact might more properly be called an "adze." Its length is 15.8 cm. and its width 10.9 cm.

The material is "a heavy, basic igneous rock, an olivine dolerite of specific gravity 3.03."[1] This is not distinctive

[1] John L. Ridgway, *Scientific Illustration*, Palo Alto: Stanford University, 1937, pp. 62–4.

* This note is published in connection with the Florida research of the Yale Caribbean Program. Thanks are due to Nile C. Schaffer, Acting Director, Florida State Museum, for his generous cooperation.

[1] Identification by Professor Adolph Knopf, Department of Geology, Yale University.

enough to determine its provenience. Similar material is known from the West Indies, but it might instead have been derived from the Late Triassic traprock in North Carolina.

FIG. 55

That the artifact is West Indian in type, however, cannot be doubted. It is of the "eared" type, characteristic of the islands.[2] So far as the writers are aware, nothing like it has previously been reported from the North American mainland, although somewhat similar forms are common in northeastern South America.[3]

The West Indian eared axes used to be called "Carib" after the historic Indian occupants of the Lesser Antilles, where they occur in greatest concentration. It is now known that they were made by the Arawak, whom the Carib replaced in the Lesser Antilles only a generation or so before the arrival of Columbus.[4]

While eared axes have been found throughout the Greater Antilles as far west as Cuba,[5] their number is not great enough to establish that they were made there, nor small enough to indicate for sure that they were obtained by trade from the Lesser Antilles. Surprisingly, they occur both in Arawak sites, as in the Lesser Antilles, and in middens of the Ciboney Indians, who are supposed to have preceded the Arawak in the Greater Antilles, surviving alongside them only in out-of-the-way places.[6]

Evidence concerning the age of the eared axes has been obtained only in Puerto Rico, where they were excavated in stratigraphic units dating from Periods II and III of a four-period sequence.[7] Period III is estimated to have lasted from 1200–1450 A.D.

The two flint points and potsherd found with the Florida ax are local in type. The sherd, with its check-stamping, is a late form characteristic of the St. Johns II period from 1200 to 1700 A.D.,[8] a date which agrees well with that of the eared type of ax in the Antilles.

Further data on the Florida find seeming desirable, Nile C. Schaffer, Acting Director of the Florida State Museum, was asked to check its provenience. He was able to interview its finder, Mr. Sargent, who, although now elderly, remembered clearly the details of its discovery. Mr. Sargent said that he had found the ax, points, and sherd in a plowed field containing no particular concentration of refuse, about 30 feet from the edge of Prairie Creek and 100 yards below Newnan's Lake. He stated definitely that the specimens were not in a mound, although he was aware that there are "mounds" in the vicinity.

During the summer of 1947, the senior author visited the region with W. W. Ehrmann and Floyd Newman of the University of Florida. We investigated the only nearby refuse deposit, Prairie Creek Midden, which is about 50 yards north of the place where the ax is said to have been found, making a small collection of sherds to supplement those from the midden and its vicinity already contained in the Florida State Museum. Since it is probable that the former occupants of this area may have possessed the ax, it will be discussed briefly.

Prairie Creek Midden is about 100 yards east of Prairie Creek, north of state road no. 20, and just south of Newnan's Lake. It measures approximately 100 feet from north to south and 75 feet east–west. The deposit, consisting of sherds, flint chips, and other refuse in a black soil matrix, varies from 2 to 3 feet in depth and rests on white sand. Amateur diggers have badly pitted the site. A low cypress swamp lies between the midden and the creek, but the land rises to the east and south, where the ax is said to have been found.

Analysis of the collections from the midden and vicinity indicates that the area has been long and intensely occupied.[9] This was to be expected in view of the favorable ecological position at the outlet of the lake.

---

[2] J. Walter Fewkes, "A Prehistoric Island Culture Area of America," *Annual Report, Bureau of American Ethnology*, No. 34, Washington, 1924, pp. 108–9, Pls. 30–2; Sven Lovén, *Origins of the Tainan Culture, West Indies*, Göteborg, 1935, pp. 171–210.

[3] E.g., Henry and Paule Reichlen, "Contribution a l'archéologie de la Guayane Française," *Journal de la Société des Américanistes*, N.S., Vol. 35, Paris, 1947, pp. 21–4, Fig. 4.

[4] Fewkes, *op. cit.*, p. 267.

[5] M. R. Harrington, "Cuba before Columbus," *Indian Notes and Monographs, Museum of the American Indian, Heye Foundation*, New York, 1921, Vol. 1, Fig. 27, p. 118.

[6] Irving Rouse, "West Indies," in "Handbook of South American Indians," Vol. 4, *Bulletin, Bureau of American Ethnology*, No. 143 (in press).

[7] Irving Rouse, "Porto Rican Prehistory," *New York Academy of Sciences, Scientific Survey of Porto Rico and the Virgin Islands*, Vol. 35, Nos. 3–4 (in press).

[8] John M. Goggin, "A Preliminary Definition of Archaeological Areas and Periods in Florida," AMERICAN ANTIQUITY, Vol. 13, No. 2, pp. 114–27, 1947.

[9] The material in the Florida State Museum includes a series of accessions, all apparently from this immediate vicinity (i.e., along Prairie Creek just south of the lake). These include (accession number given): "Prairie Creek Mound" 293, 3635, 3637), "vicinity of Prairie Creek Mound" (231, 320, 336, 358, 406, 451, 473, 492, 499, 546, 596, 603, 628), "six miles southeast of Gainesville" (85, 93), "Vidal Farm" (84), and "along the A.C.L. tracks south of Newnan's Lake" (17). The Yale collections are all from the midden itself.

A total of 567 sherds have been classified. The types are too numerous to list here, as they include almost all of the regional forms as well as trade specimens from other areas. The whole temporal range of ceramic development in Florida is represented. From the earliest period, Orange, come the Orange Plain type, Orange Incised, and St. John's Incised, as well as a single Stallings Island Punctated sherd, native to the Georgia coast. A series of a simple and linear stamped gritty-ware sherds probably falls within the next time horizon, St. Johns Ia, equivalent to Deptford and Santa Rosa-Swift Creek on the Gulf Coast. The Weeden Island culture is represented by ten types. Some of these may date from as early as St. Johns Ib; a subsequent occupation of the area during St. Johns II times is clearly shown by the presence of the diagnostic St. Johns Check Stamped and Wakulla Check Stamped forms. Local types of the latter period include Gainesville Linear Punctated, Alachua Cob Marked, and Prairie Cord Marked. Very late diagnostic trade types are rare, including only two questionable Fort Walton sherds. Numerous unclassified incised and punctated gritty and chalky ware sherds cannot be placed.[10]

A breakdown of the material from the midden and from its vicinity shows little basic difference between the two groups, although the latter includes both more specimens and more types than the former. Nevertheless, the range of specimens is the same in both cases.

Assuming that the stone ax and its accompanying specimens belong with the rest of the material from the midden and vicinity, we are unable to come to any conclusion concerning its age. This immediate area seems to have been occupied from the earliest pottery-making times until the most recent protohistoric period. The ax could have been associated with any culture present during this range.

Since the ax is not only the first of its kind to be reported from Florida but also the only clean-cut example of a West Indian specimen from the Southeast, it is necessary to consider carefully the possibility of a mix-up in provenience. Mr. Sargent, when queried, was certain that the ax was the one he had found in the Prairie Creek locality. He appears to be entirely reliable. Except for the ax, he has collected only a few sherds and points, picking them all up himself in the vicinity of his home. Neither he nor any of his close associates has been to the West Indies. His recoilection of the circumstances of the find are convincing.

It is not likely, either, that the ax was miscatalogued after its arrival in the Florida State Museum. The Museum is almost entirely limited to specimens from the state of Florida and lacks West Indian material.

The possibility that the ax was recently deposited where found must also be considered. Although information concerning the exact locality is incomplete, there are no data to suggest deposition later than the accompanying sherd and other specimens found in the vicinity. The absence of any traces of historic occupation is perhaps significant in this connection.

We conclude, therefore, that the ax was probably deposited by the Florida Indians during prehistoric times. If so, it must be a trade object from the West Indies—the first such to be reported for the southeastern United States.

JOHN M. GOGGIN
IRVING ROUSE
Department of Anthropology
Yale Peabody Museum
New Haven, Conn.
November, 1947

[10] For a discussion of the above types and periods, see Goggin, *op. cit.*

THE CULTURAL CONTEXT OF THE CRYSTAL RIVER NEGATIVE-PAINTED STYLE*

In 1944, the present writer, in collaboration with Philip Phillips, published a short analytical article upon a newly discovered (or recognized) style of negative-painted pottery from Crystal River, Florida.[1] The ceramics in question, numbering three vessels in all, were excavated many years before by Clarence B. Moore and illustrated by him.[2] They were taken from a sand burial mound in association with a number of other artifacts and with human burials. In our 1944 analysis it was pointed out that these Crystal River specimens exhibited the same technical processes of decoration—a negative or resist-dye application of a dark design background over a lighter-colored surface—as that seen on numerous Middle Mississippian pottery bottles; nevertheless, it was also made clear that the style of the painting, the forms of the vessels, and the quality of the ware were distinctly non-Mississippian. These occurrences of negative-painted specimens of a unique type on the Florida Gulf Coast raised an interesting question of cultural context. If the Crystal River burial mound could be dated as a unit within the late Middle Mississippian horizon or Temple Mound II stage of Southeastern prehistory, then the Crystal River negative-painted pieces, although aberrant stylistically, could be explained as the result of a common late diffusion of the resist-dye technique through the southern United States. On the other hand, if the Crystal River mound was considered as definitely and wholly earlier than the late Middle Mississippian horizon, the appearance of negative-painting on the Florida Gulf would be the earliest known instance of the method in the East.

The resolution of this problem of cultural context was attempted in the 1944 paper. The dating of the Crystal River mound turned mainly upon the point whether its contents could be placed as prior to or after the Weeden Island period of the Gulf Coast. A pre-Weeden Island dating would have successfully established Crystal River and its negative-painted style on the Hopewellian horizon; a post-Weeden Island dating would have extended it upward in time to overlap the Florida Ft. Walton period and, by inference, the Etowah-Tennessee-Cumberland manifestations of Middle Mississippi. Our conclusions at that time were somewhat hedged but leaned toward the interpretation that the Crystal River burial mound was late, late enough, in fact, to have been influenced by the Etowah and Ten-

* Published by permission of the Secretary, Smithsonian Institution.
[1] Willey and Phillips, 1944.
[2] Moore, 1903, Figs. 27, 28, and 31 on pp. 388, 389, and 391.

nessee-Cumberland cultures which possessed negative-painted pottery.

In resolving the question of sequence position in favor of a post-Weeden Island dating we were dependent solely upon typological analyses of the artifact contents of the Crystal River mound. At that time these contents presented something of a dilemna. Since then, as a result of a recent museum survey, I have been led to believe that we were wrong in our 1944 analyses and that the Crystal River burial mound and its contents are pre-Weeden Island or truly Hopewellian in general time period.[2]

In November 1947, in the company of John M. Goggin, a portion of the original Moore collections was studied at the R. S. Peabody Museum at Andover. These were largely vessels which were not described by Moore in his Gulf Coast

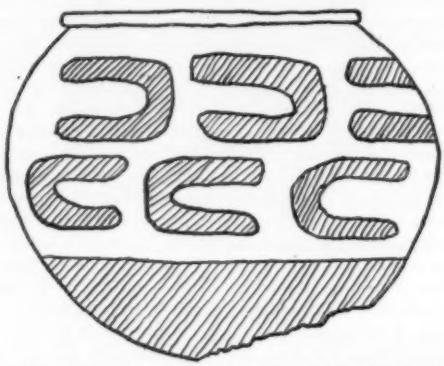


FIG. 56. Vessel in the Crystal River Negative-Painted style from the Green Point mound, northwestern Florida. Diameter 9 cms. (Areas indicated by hachure are painted a dull black.)

reports but simply included under general statements to the effect that "numerous vessels of stamped ware," "undecorated vessels," or "vessels of the usual type" were also found in the mound. A large percentage of these Andover pots were complicated stamped, many of them being representative of the early variety of the type Swift Creek Complicated Stamped. One small bowl, however, was in the Crystal River Negative-Painted style.[4] In form and ware characteristics it is very similar to one of the three negative pots shown by Moore from Crystal River.[5] It is a flattened-globular bowl with a narrow flattened-fold or flanged rim. The diameter is 9 cms. The ware is fine and homogeneous, and tempered with sand and mica. Surfaces are fired to a buff color but the paste core is black. The exterior surface is carefully smoothed. The dull-black dye of the decoration is worn faint but is still clearly observable. The design consists of two rows of open rectangles or horseshoe-shaped figures. These are reminiscent of the over-painted designs on another of the Crystal River negative specimens.[6] (See Fig. 56.)

The most significant thing about the Andover specimen is its context. The vessel was found in Moore's excavation of the Green Point mound.[7] This was a low sand burial mound located on the northwest Gulf Coast a few miles east of the mouth of the Appalachicola River. According to Moore, most of the pottery in the Green Point mound was complicated stamped and most of the complete vessels had tetrapodal supports and scalloped rims. The sherds illustrated by Moore appear to be those of the early variety of Swift Creek Complicated Stamped.[8] Similarly, the pottery from the Green Point mound, now at Andover, includes, besides the negative vessel, three early Swift Creek specimens, one Franklin Plain jar, and one Weeden Island Plain vessel. Except for the Weeden Island Plain, the mound is predominantly of the Santa Rosa-Swift Creek period, antedating the Weeden Island period. A curious shaped jar with a scalloped rim is also illustrated by Moore as coming from the Green Point mound.[9] This specimen is decorated with incisions and punctations but is not of the Weeden Island style. The nature of the incised and punctated decoration suggests, instead, the incised and punctated style at Crystal River.

It was this Crystal River Incised style[10] which misled me in the 1944 analysis. At that time, I felt that most of the incised and punctated pottery from Crystal River was neither Weeden Island nor could it be included in any of the incised and punctated types known for the Santa Rosa-Swift Creek period. The quality of the incision and punctation suggested instead Ft. Walton Incised. This, combined with the presence of the negative-painted pieces[11] and the absence of indisputable early pottery such as the Swift Creek or Santa Rosa types, except as sherds in the mound fill, argued for a post-Weeden Island dating. Opposed to this were the several tetrapodal-support and scalloped rim vessels in the Crystal River mound, the copper and silver-plated ear-spools of the Hopewellian type, the conjoined copper tubes, monitor pipes, and the cache of celts, all of which bespoke an earlier horizon. These last could only be reconciled with a late Weeden Island or Middle Mississippian dating as follows:

> "It would seem that long after the peak of development in the Ohio Valley, Hopewellian objects were passing from hand to hand—and doubtless being imitated—in ever-widening circles. Only by means of some such rationalization as this can we reconcile the Hopewellian material [at Crystal River] with a late Weeden Island date."[12]

The postulation of cultural lag as the explanation for the Crystal River assemblage was not highly satisfactory, but at the time it seemed the best way out of the dilemna. An alternative, but even less satisfactory, explanation was to

[2] Both J. B. Griffin (1946) and G. I. Quimby (Martin, Quimby, and Collier, 1947) have favored a Hopewellian dating of the site.

[4] R. S. Peabody Foundation, Cat. No. 39147.

[5] Moore, 1903, Fig. 27; Willey and Phillips, 1944, Pl. 16, *upper*.

[6] Moore, 1903, Fig. 31; Willey and Phillips, 1944, Pl. 16, *lower*.

[7] Moore, 1902, pp. 249–57.

[8] Moore, 1902, Figs. 205, 206.

[9] Moore, 1902, Fig. 209.

[10] Moore, 1903, Figs. 18, 21, 35; 1907, Figs. 1, 3, 9.

[11] In favoring a late or post-Weeden Island date for the mound and its artifact assemblage, the present author admits to a degree of circular reasoning concerning the negative-painted specimens. He was undoubtedly influenced by their presence in assigning the late date.

[12] Willey and Phillips, 1944, p. 181.

consider the Crystal River mound as stratified or mixed as to cultural components.

The recent Green Point find, together with an examination of additional sherd material now in storage at the Annex of the Museum of the American Indian Heye Foundation, reverses my earlier opinion and does away with the necessity of accepting either explanation.[13] If the Crystal River finds are interpreted as wholly pre-Weeden Island, the Hopewellian traits and the ceramic features such as the tetrapod and scalloped rim fall into chronological line. This, of course, means the acceptance of the Crystal River Incised type and the Negative-Painted type as Hopewellian in period.[14] That the negative and the incised and punctated techniques were intimately associated, is demonstrated by a sherd from Crystal River in the Heye collections. This fragment bears incision and zoned punctations combined with zoned negative painting. It is illustrated by Moore[15] and by Greenman[16] but is not described by either. That both types are of a Florida Hopewellian or Santa Rosa-Swift Creek origin is corroborated by a distinctive thinness of the ware and a pronounced micaceous quality of the temper. These are Santa Rosa-Swift Creek characteristics. The Crystal River Incised type, as it is now recognized, offers a satisfying prototype for the subsequent Weeden Island Incised and Punctated types. While it has been considered for some time that Weeden Island was an outgrowth of the Hopewellian tradition,[17] the steps by which this transformation took place and the locality in which the development was accomplished were not evident.[18] By considering Crystal River as a related manifestation contemporaneous to Santa Rosa-Swift Creek, or, perhaps, the elaborate mortuary complex of the Santa Rosa-Swift Creek culture and period, we may offer the answer to these problems. More evidence is needed, but the evolution of the Weeden Island style out of the Crystal River complex as a local Floridian development is certainly suggested.

The Hopewellian dating of the negative-painting technique within the eastern United States is extremely interesting from the viewpoint of hemisphere-wide diffusions. In Middle America the trait appears early in certain regions and was included by Vaillant in the famous "Q-Complex" of Formative Stage traits. Its close temporal relationships to early incised and rocker-stamped pottery in Middle and even South America have been remarked upon.[19] We have until now tended to think of it as a late phenomenon in the southeastern United States, but the Florida evidence indicates a contemporaneity with early ceramic techniques and styles that is more compatible with its context of associations in Middle and South America.

Having been wrong once in attempting to date the negative style and to interpret the Crystal River mound, I am, again, closing on a word of caution. There are always doubts concerning the proveniences of materials excavated in past years when archaeologists adhered less strictly to principles of careful cataloging and recording. Such errors are possible in the data with which we are now dealing, although I do not think that they are probable. New field discoveries, either of stratigraphic inclusion or burial association, are needed to clinch absolutely the cultural dating and associations of Crystal River. For the present, the occurrences and period correlations of the Crystal River Negative-Painted style can be summarized as follows:

1. Crystal River Burial Mound: 4 specimens. These date, by inference, from the Santa Rosa-Swift Creek period.
2. Green Point Burial Mound: 1 specimen. The dating of the mound is indisputably Santa Rosa-Swift Creek.
3. Warrior River, Burial Mound B: 1 specimen (Heye Museum Cat. No. 18/251). Vessel with a scalloped rim and rectilinear nested-triangle panel design in black. The dating is early Weeden Island or Weeden Island I.

LITERATURE CITED

GREENMAN, E. F.
1938. "Hopewellian Traits in Florida." AMERICAN ANTIQUITY, Vol. 3, No. 4, pp. 327–32.

GRIFFIN, J. B.
1946. "Cultural Change and Continuity in Eastern United States Archaeology." In "Man in Northeastern North America," *Papers of R. S. Peabody Foundation*, Vol. 3, 37–95. Andover.

MARTIN, P. S.; G. I. QUIMBY; AND D. COLLIER
1947. *Indians Before Columbus*. Chicago: University of Chicago Press.

MOORE, CLARENCE B.
1902. "Certain Aboriginal Remains of the Northwest Coast of Florida, Part 2." *Journal of the Academy of Natural Sciences of Philadelphia*, Vol. 12. Philadelphia.
1903. "Certain Aboriginal Mounds of the Central Florida West Coast." *Journal of the Academy of Natural Sciences of Philadelphia*, Vol. 12, Pt. 3. Philadelphia.
1907. "Mounds of the Lower Chattahoochee and Lower Flint Rivers." *Journal of the Academy of Natural Sciences of Philadelphia*, Vol. 13. Philadelphia.

STRONG, W. D.
1943. "Cross-Sections of New World Prehistory."

[13] In Dr. Willey's recent article on the Manatee Region (Willey, 1948, Table 12, p. 216), the Crystal River material was placed in the later period, equivalent in time to Ft. Walton. This was an editorial mistake. In the table as originally submitted, Dr. Willey had included both a "Crystal River 1," consisting of the Hopewellian-like material and equivalent in time to Santa Rosa-Swift Creek, and a "Crystal River 2," comprising the rest of the material and contemporaneous with Ft. Walton. He discovered the additional data, confirming the early Hopewellian-Santa Rosa-Swift Creek date, while the article was in press and asked the editor to delete the "Crystal River 2." Instead, we erroneously removed "Crystal River 1" from the table, thereby making Crystal River appear entirely late, a dating which Dr. Willey had never intended. *Editor.*

[14] This recalls Greenman's inference of several years ago that the Crystal River mound was Hopewellian in content (Greenman, 1938). In his brief analysis Greenman was hesitant to accept most of the ceramics into this category and avoided mention of the negative-painted pieces.

[15] Moore, 1903, Fig. 20, left center sherd.

[16] Greenman, 1938, Fig. 20, upper right corner.

[17] Willey, 1945, pp. 244–5.

[18] Concerning this I had stated (Willey, 1945, p. 244): "Antecedents of Weeden Island may be found in the Marksville-like types of Santa Rosa-Swift Creek, but it is recognized that Marksvillian strains alone cannot account for Weeden Island ceramics."

[19] Strong, 1943, p. 32.

Smithsonian Miscellaneous Collections, Vol. 104, No. 2. Washington.

WILLEY, GORDON R.

1945. "The Weeden Island Culture: A Preliminary Definition." AMERICAN ANTIQUITY, Vol. 10, No. 3, pp. 225–54.

1948. "Culture Sequence in the Manatee Region of West Florida." AMERICAN ANTIQUITY, Vol. 13, No. 3, pp. 209–18.

WILLEY, G. R., AND P. PHILLIPS

1944. "Negative-Painted Pottery from Crystal River, Florida." AMERICAN ANTIQUITY, Vol. 10, No. 2, pp. 173–85.

GORDON R. WILLEY
Bureau of American Ethnology
Smithsonian Institution
Washington, D. C.
December, 1947

A PROTOTYPE FOR THE SOUTHERN CULT*

Eastern archaeologists are familiar with the phenomena which have, in recent years, been interpreted as the Southern Cult. Although there is some dispute concerning the functional nature of the Cult, its exact position in the prehistoric time scale, and the sources which inspired it, there is common recognition of its elements and widespread occurrences.[1] These component elements are artistic motifs and certain specialized, non-utilitarian artifact types which are bound together by a unity of style and technical treatment. The geographic occurrences are predominantly Southeastern but extend from the Atlantic to the western periphery of the Mound Area. The intrinsic qualities of the elements easily lend them to interpretation as ritualistic symbols and paraphernalia, and their frequent appearance in large mound sites adds to the implications of ceremonial import.

Controversy over the dating of the Cult has centered mainly upon a pre- or post-De Soto assignment. Ford and I[2], and Griffin[3] were at one time of the opinion that the rise and spread of the Cult occurred after 1540 A.D.; Waring[4] and Krieger[5] argued for a Cult inception and climax before the De Soto entrada. In either case, and for the purposes of the present note, there is general agreement that objects of the Cult style date entirely within the Temple Monud stage or Middle Mississippian horizon.

Another point of debate has been the matter of Cult antecedents, particularly with reference to the importance of Middle American influences. The question has not been so much the absolute presence or absence of Mexican ideas but the timing, quantity, and significance of these possible introductions in giving rise to the Cult in the eastern United States. The trend in recent discussions has been to see the Cult less as the result of a sudden Middle American stimulus than as the emergence of a religious, political, and social symbolism which reflected local Southeastern forces and which drew many elements from earlier cultural horizons. Krieger[6] and Webb and Snow[7] have looked to Hopewellian and Adena levels for some of these earlier, local inspirations. This article calls attention to such a possible Southeastern prototype of Southern Cult art.

In a recent paper,[8] I have re-evaluated the evidence for the cultural placement and dating of the burial mound at Crystal River, Florida. The assemblage of ceramics and artifacts which Moore obtained from the site[9] must, I believe, be dated as a whole and equated with the Santa Rosa-Swift Creek period of the Gulf Coast. The sequence position of Santa Rosa-Swift Creek aligns with Louisiana Marksville and Ohio Hopewell. With this chronological evaluation in mind two pottery sherds from Crystal River take on new meaning.

The first of these was taken from the mound on Moore's visit to Crystal River in 1903.[10] The second sherd was recovered from the old dump heap during the 1906 excavations;[11] and it was Moore's opinion that both came from the same tall, cylindrical vessel. Although the fragments do not fit together, the ware, the curvature of the sherds, and the technique and nature of the design suggest this. The original vessel must have been at least 20 cms. high if not taller. The ware is thin, well-fired, and sandtempered. The color is natural buff and the surfaces are fairly well polished. The decoration has been accomplished by incision augmented with dot punctations. In some places this incision gives the appearance of engraving, but it is more likely that the designs were scored onto the vessel surface after air-drying but before firing. There are several instances where small sections of the vessel surface have been excised in a sort of champlévé technique. The first sherd (Fig. 57, *left*) shows the outline of a human hand and wrist as the central feature. The fingers are long and tapered, the nails carefully indicated, and curious patches have been drawn on the four knuckles which are visible. On the back of the hand is a design which may possibly be a bow-and-arrow. On the wrist is a tear-drop filled with dot punctations. A small section of a complicated design is seen at lower left, and at the right is a larger composition which might be the edge of a human face. The second piece (Fig. 57, *right*) is more fantastic. Just below the rim is a circle in which is a bird with wings spread and head and bill pointed upwards. Parallel curved lines transect the upper portion of the circle and at the very top there is a concavity in the circle from which depend five short lines in "sun-ray" fashion. Eight small circles surround the figure of the bird within the larger circle. On the back (or breast) of the bird is another small circle within a four-pointed star. Below the bird-circle composition are the long, tapered fingers of a human hand with fingernails again well-

* Published by permission of the Secretary, Smithsonian Institution.

[1] Waring and Holder, 1945; Krieger, 1945.

[2] Ford and Willey, 1941.

[3] Griffin, 1944.

[4] Waring, 1945.

[5] Krieger, 1945.

[6] Krieger, 1945, pp. 503–7.

[7] Snow, 1945, pp. 339 ff.

[8] Willey, 1948 (this issue, pp. 325–8).

[9] Moore, 1903, 1907.

[10] Moore, 1903, pp. 383–4, Fig. 18.

[11] Moore, 1907, pp. 410–11, Fig. 3.

indicated. In the right corner is what appears to be a section of a human nose, eye, and forehead in profile. The human figure, if such it is, is apparently wearing a headdress.

These unusual sherds bear a resemblance in incision-punctation techniques to the type Crystal River Incised which was also found in the mound.[12] This is the best identification that can be made now in terms of recognized Florida pottery types, and the Crystal River Incised type, along with the other contents of the Crystal River mound, is dated in the Florida Hopewellian or Santa Rosa-Swift Creek period.

The sherds also have suggestive resemblances to the Southern Cult motifs. These resemblances are not ones which can be recapitulated under the term style. The manner of execution and the modes or small details of representation are not the same as those described and illustrated as a part of the Southern Cult. The hand, for example, is a common Southern Cult element but the Crystal River hands show subtle differences. The latter tend to have long, delicately tapered fingers while the Cult hands are broader and stubbier.[13] Nor do the Cult hands show the slight, graceful flexure of the fingers seen in the Crystal River hand. In these two features the Crystal River hand designs are much closer to the Ohio Hopewell hand representations in cut mica.[11] Another parallel of elements and element arrangement, but also a dissimilarity in the nature of the drawing, is the presence on the Crystal River hand of an exotic, non-naturalistic device. In Southern Cult material this is commonly an eye or sometimes a cross-in-circle. The Crystal River device is not these or if it was so intended has been given an entirely different representation. There is, however, a vague suggestion of the bi-lobed arrow about it. The bird design is unlike birds in Southern Cult art, but, again, the circle-and-star figure on the back is reminiscent of the Cult sun circle.

The significance of these Crystal River pieces is that they offer one of the most convincing prototypes for Southern Cult art in the southeastern United States. Their time position is sufficiently early and the representations, while not in the Southern Cult style, are similar enough to imply a connection. Comparable material seems to be relatively scarce. At Pierce Mound A, near Appalachicola, Florida, Moore found a cylindrical beaker with hand designs executed in the Crystal River Incised style.[15] This mound shows other parallels with Crystal River and is, undoubtedly, of the Santa Rosa-Swift Creek or Florida Hopewellian period.

The where and how of the continuity of Hopewellian art forms into Middle Mississippi horizon cult manifestations is, of course, an open problem. Such a continuity is not traceable in the archaeology of Gulf Florida as I now know it, for in the Weeden Island period, subsequent to Santa Rosa-Swift Creek but antedating the Mississippian level, there is nothing that suggests the Southern Cult to the same degree as the Crystal River finds. And, of course, such a continuity of artistic elements, if it does somewhere exist, is not necessarily more than just that. No continuity of "cult" is implied. The Southern Cult, if one agrees with Waring, was a politico-religious and social movement which utilized a certain art symbolism confined within a style and frozen into a system. The disparate representational elements of such a system may have been drawn from many heritages, but the forces motivating the need for a systematic symbolism may have had no other antecedents than the social interaction of the moment.

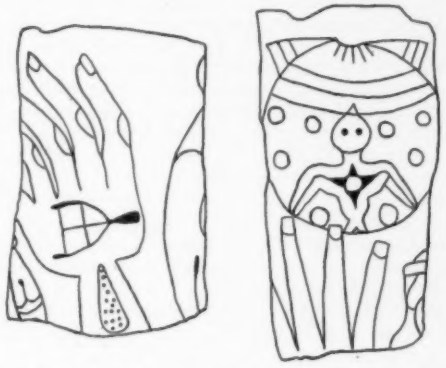


FIG. 57. Incised sherds from the Crystal River burial mound, western Florida. Left figure is 14 cms. high. (Redrawn from Moore: *left*, 1903, Fig. 18; *right*, 1907, Fig. 3. Solid black areas indicate zones of complete excision of paste by champlévé-like technique.)

[11] See Moore, 1903, Figs. 21, 35; 1907, Figs. 1, *lower left*, and 9.
[12] See Waring and Holder, 1945, Fig. 1, *VII*.
[13] See Shetrone, 1930, Fig. 62, *top*.
[15] Moore, 1902, Fig. 158.

LITERATURE CITED

FORD, J. A., AND G. R. WILLEY
1941. "An Interpretation of the Prehistory of the Eastern United States." *American Anthropologist*, N.S., Vol. 43, No. 3, pp 325–63. Menasha.

GRIFFIN, J. B.
1944. "The De Luna Expedition and the 'Buzzard Cult' in the Southeast." *Journal of the Washington Academy of Sciences*, Vol. 34, pp. 299–303. Washington.

KRIEGER, A. D.
1945. "An Inquiry into Supposed Mexican Influence on a Prehistoric 'Cult' in the Southern United States." *American Anthropologist*, N.S., Vol. 47, No. 4, pp. 483–515. Menasha.

MOORE, C. B.
1902. "Certain Aboriginal Remains of the Northwest Coast of Florida, Part 2." *Journal of the Academy of Natural Sciences of Philadelphia*, Vol. 12. Philadelphia.
1903. "Certain Aboriginal Mounds of the Central Florida West Coast." *Journal of the Academy of*

Natural Sciences of Philadelphia, Vol. 12, Part 3. Philadelphia.

1907. "Mounds of the Lower Chattahoochee and Flint Rivers." *Journal of the Academy of Natural Sciences of Philadelphia*, Vol. 13. Philadelphia.

SHETRONE, H. C.

1930. *The Mound-Builders*. New York.

WARING, A. J., JR.

1945. "The De Luna Expedition and Southeastern Ceremonial." AMERICAN ANTIQUITY, Vol. 11, No. 1, pp. 57–8.

WARING, A. J., JR., AND PRESTON HOLDER

1945. "A Prehistoric Ceremonial Complex in the Southeastern United States." *American Anthropologist*, N.S., Vol. 47, No. 1, pp. 1–34. Menasha.

WEBB, W. S., AND C. E. SNOW

1945. "The Adena People." *Publications of the Department of Anthropology and Archaeology*, University of Kentucky, Vol. 6, Lexington.

WILLEY, GORDON R.

1948. "The Cultural Context of the Crystal River Negative-Painted Style." AMERICAN ANTIQUITY, Vol. 13, No. 4, pp. 325–8.

GORDON R. WILLEY
Bureau of American Ethnology
Smithsonian Institution
Washington, D. C.
December, 1947

BOOK REVIEWS

Men Out of Asia. HAROLD STERLING GLADWIN. New York: Whittlesey House, McGraw-Hill Book Company, 1947. 390 pages, 5 plates, 8 maps, 138 text figures.

The reviewer has enjoyed this book more than any other anthropological work which he has read in a long time and he feels that it can be recommended to all members of the profession. They will find the text amusing and the illustrations the more enjoyable for striking resemblances, certainly not coincidental, to some of their colleagues. However, they should be warned that they may have a slight increase in blood pressure when some of the underlying ideas register. Mr. Gladwin approaches the problem of American origins with the tentative jocularity of an elderly gentleman patting a new secretary's posterior. If she objects, he can lament her lack of a sense of humor; if she does not, the next moves are obvious. Those inside the science are not likely to be seduced, but it can be prophesied that a large number of outsiders will fall and fall hard.

Mr. Gladwin's scenario is, briefly, as follows: Act 1. Australoids complete with spear throwers, boomerangs, and churingas enter America about 25,000 B.C. Suggestions that they crossed on the heels of still earlier Negritoes whose last survivors are to be found among the Yahgan and Alikuluf. No explanation of where said Negritoes would have gotten the hair straightening, skin bleaching, and plastic surgery required to make them look like Yahgan, etc.

Act II. Negroid immigrants bringing Folsom culture arrive 15,000 to 2,500 B.C.

Act III. Ancestors of Algonkins arrive with cord-marked pottery, polished celts, twined basketry, etc., 2,500 to 500 B.C.

Act IV. The Eskimo, 500 B.C.

Act V. Mongoloid peoples, equipment not specified, 300 B.C.

Grand Finale: Arrival of the fleet of Alexander the Great off Hollywood. Tableau of Greeks, Phoenecians, Babylonians, Hindus, etc., being received as Gods by trusting aborigines. Drum music and dances by South Sea Islanders about to cross the Isthmus of Panama to become Arawaks and Caribs.

Entreacts: Slapstick comedy with Mr. Gladwin belaboring a straw man in an academic gown, labeled Dr. Phuddy Duddy. This effigy will insist on every theory with which the author disagrees whether said theory is now held by professional anthropologists or not.

Since it would take another book as long as the one under consideration to answer all Mr. Gladwin's theories, a few comments will have to suffice. The reviewer believes that a date of 25,000 B.C. for the initial settlement of America is now generally accepted and that any later revision is likely to push this date back rather than bring it forward. He also believes that the fact that there have been several movements across Bering Strait is widely recognized, although the dating of the various migrations is still highly questionable. However, it seems regrettable that in his discussion of races, Mr. Gladwin should have espoused an antiquated approach to the problem of human varieties and a system of classification which is sure to be extensively revised as soon as physical anthropologists acquire an elementary knowledge of modern Biology. It is highly probable that the first immigrants to America were of the primitive, generalized type which has survived in certain Australians and Ainu, but there is no evidence that any Negroid people reached America or even got far enough north in the Old World to come anywhere near the Bering Strait bridge head. The scant assortment of supposedly Negroid features found in some American skeletal material can be adequately explained as a result of local specialization from the original generalized migrants. The subsequent three migrations would also be generally accepted, although some question would be raised as to the chronological order of the Eskimo and Mongoloid movements. In view of the Eskimo occupation of Bering Strait, it would seem more probable that they were the last Asiatic migrants.

Mr. Gladwin will find no serious opposition to his theory of Polynesian contacts from any anthropologists who are familiar with the evidence. In fact he has overlooked several items which would have considerably strengthened his case. That he has his brave Polynesians paddling their canoes stern first not only on the jacket of the book but also in the close-up on page 233, suggests that he has not made a very intensive study of the region in question. This is also suggested by his cheerful lumping together of Polynesia and Melanesia as a unit source of diffused culture elements. Many of the Melanesian elements which are duplicated in the New World do not occur in the intervening Polynesian area. One can, of course, invoke the well-known principle of the loss of useful arts *a la* Rivers, but when this is extended to any large number of elements it becomes, in the reviewer's opinion, considerably less credible than independent invention. As regards the Polynesians and Melanesians being the ancestors of Caribs and Arawaks, we can only suppose that some specially gifted seer sent his soul to spy out the land and when he wakened from his trance, informed the migrants who had reached the Pacific Coast that an island region like their own home land lay on the other side of the rugged mountains and dense jungle which confronted them when they turned their backs on the Pacific. The same seer no doubt taught them languages which bore no resemblance to the Malayo-Polynesian stock.

While it seems fairly certain that there was a little two-way traffic between the Pacific Coast of the Americas and the outer Polynesian islands, everyone would agree that this could not be held responsible for civilization in America. For this Mr. Gladwin suggests an epic voyage across the Pacific by the survivors of the fleet of Alexander the Great. This strikes the reviewer as neither more nor less probable than the earlier theory that the foundations of American civilization were laid by refugees from the lost Atlantis. However, given the author's conviction that no element of culture is likely to be invented twice in human history, this theory is a real triumph of ingenuity. All anthropologists recognize that the differences between the Old and New World civilizations are quite as striking as the similarities. If the resemblances are to be explained by diffusion from the Old World, this diffusion cannot have in-

volved continuing contact with any one, or even any two or three, of the Old World civilizations. The odd assortment of culture traits which the two continental areas have in common must have been brought to America by a singularly heterogeneous collection of castaways and Alexander's seaman mercenaries would fill the bill better than most.

Actually, the reviewer believes that the similarities between Old and New World technologies have been considerably overestimated. Although the end products of such technologies were often much the same, studies of the actual methods of manufacture often reveal significant differences. Thus the American method of lost-wax casting, if we are to take that of the Aztecs described by Sahagun as typical, was different at several points from anything used in the Old World. The New World lagged sadly behind the Old in its development of mechanical appliances. Its craftsmen achieved their finest results through the development of uncanny skill in working with very simple apparatus. The Andean textile industry is a classic example of this but by no means an isolated one.

While the comparative analysis of Old and New World technologies makes the theory of independent origins appear much more probable, it does not account for the very sudden emergence of high cultures in certain parts of America. There are undoubtedly areas in which this emergence will appear much less sudden when we have a more complete archaeological record, but in some regions civilization seems to have sprung up, flowered, and then practically stabilized within a period of not more than three or four centuries. If we cannot accept the theory of foreign influences, we should not ignore the problem which such situations present. This problem is not exclusively an American one. The beginnings of the Sumerian ascendancy in Mesopotamia and the first two or three centuries of the Dynastic Period in Egypt were marked by equally rapid developments which seem to have been as autochthonous as any which took place in the New World. The reasons for such veritable mutations of culture are still unknown and would seem to offer an unusually promising field for research in the dynamics of culture growth.

RALPH LINTON
Department of Anthropology
Yale University
New Haven, Conn.

Man in Northeastern North America. Edited by FREDERICK JOHNSON. Papers of the Robert S. Peabody Foundation for Archaeology, vol. 3. Andover, 1946. xi+347 pages, 1 plate, 21 figures. $2.00.

The long awaited appearance of *Man in Northeastern North America* finally makes available several important essays which have been widely circulated in manuscript and utilized in already published works. The bulk of the volume was written prior to 1941, and many of the specific items of fact and interpretation now need revision because of more recent information. This book represents an unfortunate development of recent years, the temporary unavailability of important studies to any but a few anthropologists, and the tendency for archaeological papers to be outdated by the time they reach publication. This review is concerned with the major significance of the articles discussed rather than with more detailed criticism, much of which would be unjustifiable at this late date.

Byers' "Environment of the Northeast" provides the best-up-to-date summary available of the climate, resources, and ecology of the Northeast. He sketches the geological and physiographical background, and sets his observations on the Late Woodland environment and evidences of previously differing climatic situations against this description. Most noteworthy is his attempt to suggest changing forest climaxes, climatic conditions, and water levels within the post-Pleistocene. Further information on such shifts and the correlation of archaeological horizons with specific climatic settings will doubtless contribute much to Northeastern culture history; even the correlation of archaeological sites with earlier sea and river levels is only beginning in this area. Specific data on the faunal and floral associations of carefully defined archaeological complexes characteristic of certain river levels in the post-Pleistocene would contribute much to a sound culture chronology for the area. One also thinks in this connection of great auk and sea mink from the shell heaps, of Volk's musk ox bones from Trenton, of the giant beaver tooth from the Abbott Farm Site, and of bison from an Irving, New York site. Practically nothing is known of the temporal and geographical distributions of such associations.

Byers' consideration of possible local origins for native copper, and presumably for silver, certain jaspers, chalcedonies, cherts, agates, and other materials, indicates the need for more knowledge of the sources and mineralogical characteristics of lithic materials, and for more extensive collection, distribution, and comparison of quarry samples. The sources and distributions as specific artifact types at specific time levels of materials found geologically in restricted locales have considerable implication in the archaeology of this area, and are far from well known. These lithic materials ultimately present problems for the mineralogist, rather than the archaeologist, although their use appears to be culturally determined and not adventitious.

Some interesting problems relating to the effects of the Indian population on environment are discussed at length. Most conspicuous is the practice of burning of brush and leaves in forested areas, a widespread trait in deciduous areas of the Eastern Woodlands. Perhaps this might in some locales produce parklands and open grasslands, but the accounts do not indicate so. This annual autumnal burning of the forests was still practiced as late as 1880 by the Cherokee of western North Carolina, and apparently did not contribute to the formation of balds and savannahs. Each fall's fires burned merely the leaves and trash of one year's accumulation, and were intended to check the growth of briars and brush, to rout out deer and bear, and to make easier the collection of nuts, persimmons, and such. Even balsam and hemlock stands were apparently not seriously affected by such fires in North Carolina.

Of major implication is the question of the extent and

continuity of the boreal forest zone since the close of the Pleistocene. Available data indicate two centers, eastern and western, for this forest, with an intermediate open zone. The possibility of forest continuity in the southern portion is stressed, however, and problems of the time and route of dispersal of Woodland hunters from Asia into the Northeast are considered open. The extent of any break and the specific culture of the migrants would be primary factors.

McKern's "Cultural Perspective" points out that the Northeast is not a valid culture area, and cannot be correlated with any single archaeological Woodland segment. He stresses the lack of unity of the region, and the shifting, evolving aspects of cultures which are not at all isolated from transitions in other areas. Fundamentally, he presents valid objections to the culture area concept, and suggests that other cultural problems be discussed; a decision with which everyone no doubt now agrees.

Griffin's "Culture Change and Continuity in the Eastern Woodlands" has been extensively circulated as a manuscript for the past five years and is already well known to many of the individuals working in the Eastern Woodlands. Its influence may be seen in several recent syntheses of North American archaeology. Griffin's primary interest is in the interpretation of the development and growth of the aboriginal cultures of the Eastern Woodlands and in outlining patterns which may be studied and worked out in any area but which must be interpreted on a continental scope to understand the full significance of the cultural history of the Northeast. Such studies may be pursued regardless of the place or manner of origin of traits involved, and without recourse to innumerable postulated migrations of populations. Griffin sees in each archaeological pigeonhole evidences of interaction with other geographic and chronological segments. A balanced picture of stages and continuities is correlated with his emphasis on studies of the temporal and spatial distribution of cultural material, rather than population movements or classification, as the primary subject of archaeology at its present stage of development. The result is an over-all picture of eastern United States archaeology, highly condensed. It is to be most recommended because it indicates the extent to which complexes in little known areas may be related to demonstrable sequences in other sectors on typological grounds. Such inferential temporal assignments do not constitute demonstration, but are a major part of the process by which relevant problems are set up for testing in any area. More recent work in the Northeast has emphasized, rather than detracted from, the consistency of Griffin's picture of cultural development in the area.

The strongest portion of Griffin's essay is his interpretation of Hopewellian as a culture complex and a chronological unit. His discussion constitutes what is probably the most fruitful approach to the Middle Woodland of the Eastern Woodlands and Mississippi Valley. Almost as significant is his interpretation of preceramic complexes throughout the East, as related to western Paleo-Indian horizons, and his recognition of culture change and time depth within this period. Statements about Spiro and the Southeastern Cult now appear to be improbable, but most of the available sources of information were utilized in Griffin's synthesis, so that the outdating of his paper is minimized and many of the manuscript sources utilized are still unpublished. Local students will find most objections with the charts, relatively few with the text.

Ritchie's "Archaeological Manifestations in the Northeast" outlines the New York sequence and attempts to relate this to specific complexes in other areas and to set his stages in an over-all picture of the Eastern Woodlands. Characteristic features of the Late Woodland of New York are correlated with the dominance of Mississippi groups, and it is suggested that Owasco and Iroquois Aspects belong in a Mississippi Pattern. The discussion of the Woodland interpretation of Hopewell and related complexes is related to the New York situation. Four migrations of population are inferred, but links between successive complexes are pointed out, even in the formative Iroquois Aspect. Relationships between New York and other areas are ably outlined and indicate a high degree of consistency between different sequences. The geographic and other relationships indicated for Laurentian are least satisfactory, probably because so little is known of related complexes. I fail to see what is particularly Laurentian about Red Paint, as it is known to us, for example. Detailed criticisms would be unfair, since dependent on Ritchie's later work and interpretations.

De Laguna's "Eskimo in Northeastern Archaeology" is largely revised from her *Prehistory of Northern North America as Seen from the Yukon*, and attempts to equate Eskimo-Northeastern parallels with Dorset influence. A number of significant link traits are indicated, besides a mass of others which have too little basis in artifact resemblance. Much of the material discussed is as yet too little known to make positive judgment possible, and the almost total lack of time perspective is damaging to the argument. For the traits which are shared with Eskimo, I fail to see the necessity of postulating a Dorset source while closing our eyes to what may be more fruitful hypotheses. The tentative chronology here set up for the Northeast is, however, the most unfortunate part of this essay; it is over-conservative and shows time-slope from the Eskimo area in a fashion which would permit the derivation of any Eastern Woodlands complex from Eskimo. The Eskimo derivation of archaeological traits is, however, dear to many local students, and this article will no doubt have better appeal than more considered and more tentative interpretations. Especially conspicuous is the slight sense of change of material culture with time; the more profound change in Northeastern Indian sequences, as compared with the known portion of eastern Eskimo archaeology, is perhaps the best reason for considering the Eskimo sequence a relatively recent chapter in the history of the Northeast.[1]

Spaulding's paper is an attempt to compare Early and Middle Woodland cultures in the Northeast with similar complexes in northern Eurasia, and should be especially suggestive to those interested in the Asiatic Neolithic rela-

[1] For further comment concerning this article, see above, pp. 298 ff. *Editor.*

tionships of pre-agricultural complexes in the Northeast. Enough shared traits are already apparent to indicate the fruitfulness of this approach, and the need for better definition of already described complexes as well as for work in almost unknown intermediate areas seems obvious. The peopling of the Americas and the history of Siberian-North American interrelationships are becoming extremely complex problems. Spaulding's essay is a good example of the extent to which areal isolation of archaeologists is breaking down and to which studies and interpretations of both local and continental scope are needed when we are confronted with historically related phenomena scattered over a huge area. Spaulding provides the first such careful study of wide scope.

Howells' "Physical Types" indicates two Sylvid subareas south of the Saint Lawrence, surrounded by non-Sylvid groups, with a brachycephalic factor strong north of New England. Extensions of the data back into time are so far possible only in New York. Howells' approach is largely through observational criteria, based on a small series of skulls. This paper makes available the first information on the Blue Hill crania, but generally draws on previously published sources. A number of major points which should be kept in mind for future archaeology in New England and eastern Canada are raised, most important of which is the lack of large enough series of skeletal material from identifiable archaeological horizons. Ritchie's crania indicate that the greatest variations in physical type are chronological rather than geographic within a small area, and such a situation probably holds in other sub-areas. The historical implications of physical type distributions within the Northeast are not at all clear.

Of non-archaeological nature, yet of definite significance to the archaeologist, are several trait distribution studies. The Voegelins' "Linguistic Considerations" includes some good criticisms of earlier statements about language distributions and relationships, and relevant discussion of dialect-language-family levels of various recognized languages within the six stocks considered. The non-coincidence of linguistic and cultural boundaries is noted, and the value of the paper is increased by the authors' derivation of their linguistic summaries, independent of other cultural phases. Algonkian is treated at greatest length and this portion represents the major contribution of the essay. Fisher's "Algonkian Mythology" is a very good distribution study, which should include the extralimital extents of Algonkian myth elements to be of much use to non-specialists. An extremely valuable critical bibliography is included. Hallowells' "Psychological Characteristics" is of limited interest to the archaeologist.

Flannery's "Descriptive Survey" of the northeastern Algonkian area points out, largely in terms of non-material ethnological traits, the essential unity of the area north of the St. Lawrence and Great Lakes and some major features which distinguish the cultures of this area from those of New England and the Central Algonkian regions. Strong economic-ecological-cultural correlations are indicated, and the absence of any sharp dividing lines noted. The recent archaeology of these regions is so little known that similar comparisons are not possible in terms of prehistoric material culture, but comparable differences might be expected.

Perhaps the most significant article in this respect is Cooper's essay on the Taiga biotic zone, which is concerned with the major historical aspects of man's adaptation to life in the northern coniferous forest. Cooper sees the problems of northern ethnohistory mainly from an ethnologist's viewpoint, and ably discusses the origin and history of the techniques evolved by the boreal hunter for life in this zone. While especially conscious of the problems of circumpolar trait distributions, he ably discredits such facile interpretation as the ice-hunting and snowshoe culture hypotheses, and shows an appreciation of the interaction of culture and environment and of the economic aspects of Northeastern social organization, ritual, and myth which is refreshing. Some interesting ethnic and cultural distributions are outlined, and the large number of almost unrecognized problems concerning the far Northeast is indicated. Careful perusal of this very succinct commentary provides the best introduction to the remainder of the volume, and should carry many implications for the interpretation of the earlier and most conspicuous pre-agricultural complexes in areas south of the Taiga.

JOHN WITTHOFT
University of Michigan
Ann Arbor, Michigan

Chippewa Village, the Story of Katikitegon. W. VERNON KINIETZ. Bulletin, Cranbrook Institute of Science, No. 25. Bloomfield Hills, 1947. 259 pages, 53 figures.

This is a presentation of a study of culture change during the past century among the Indians of the region south of Lake Superior. Modern conditions are compared with those of the decade around 1825, as known chiefly from the account of Colonel George Boyd and as a result of the circulation of the questionnaire by Governor Cass of Michigan. Most of the book centers around a small modern Chippewa village known today as Lac Vieux Desert, on the Michigan-Wisconsin border on the shores of a lake of that name. The author spent the summers of 1939 and 1940 here, and supplemented this investigation by visits to other native villages in the Manitoulin District of Ontario, Canada. Lac Vieux Desert was chosen for this study because of its relative isolation and long history. It was known as *Katikitegon* in the early part of the nineteenth century.

A good part of the book is made up of direct quotations from the early sources. In each chapter these come first and are followed by accounts of the modern situations. Comparisons are made *en bloc* in many cases, as indeed was necessary owing to the general nature of the early accounts and to the often complete break between 1825 and 1940. This is especially true in the matter of house types, dress, and economic life. There is more contrast and detail in the chapters on the Life Cycle, Social Life, Religion, and Medicine. The latter, consisting of 48 pages, is an excellent description of the Midewiwin as Mr. Kinietz was fortunate enough to observe in full modern version at Lac Vieux Desert. The picture given is a factual one, with little of the nature of interpretation in terms of cultural process. That

is probably an asset, and in any event it is true of the entire work.

There is an index, and 53 excellent illustrations show members of the community, scenes from the Midewiwin ceremony, and various items of material culture from the general region in the Cranbrook Institute of Science.

E. F. GREENMAN
University Museums Bldg.
Ann Arbor, Michigan

The Fossil Bison *of Alaska and Preliminary Revision of the Genus*. MORRIS F. SKINNER and OVE C. KAISEN. Bulletin of the American Museum of Natural History, Vol. 89, Art. 3, pp. 127–256. New York, 1947. 25 tables, 5 figures, plates 8–26, 3 maps.

Though the above work is chiefly a taxonomic treatment of the fossil and recent species and subspecies of the Holarctic genus *Bison*, no archaeologist or anthropologist interested in the cultures of early man and his associated vertebrates in North America can afford to be without a copy of this careful, conservative, and well written study on *Bison*.

The authors were faced with numerous invalid names as well as the question of synonymy among 32 named American and 33 named Eurasian species and subspecies of *Bison*. After many years of hard and painstaking work in examining types, as well as studying all known collections of available *Bison* material in North America, they have presented to the student of vertebrates their problems as well as their contributions of scientific facts and have placed in the laps of the Pleistocene stratigraphers the problems of Pleistocene correlation and dating of Pleistocene deposits.

The genus *Bison* has been divided into six subgenera, three of these being new names. Thirteen of the 33 previously named species and subspecies of *Bison* from Eurasia are recognized as valid and one new subspecies is named. Ten of the 32 previously named species and subspecies of *Bison* from North America are recognized as valid and two new species are named. Those found in North America are the following:

Bison (*Bison*) *bison bison* (Linnaeus).
Bison (*Bison*) *bison athabascae* Rhoads.
Bison (*Bison*) *occidentalis* Lucas.
Bison (*Bison*) *preoccidentalis* Skinner and Kaisen.
Bison (*Simobison*) *antiquus antiquus* Leidy.
Bison (*Simobison*) *antiquus figginsi* Hay and Cook.
Bison (*Simobison*) *alleni* Marsh.
Bison (*Simobison*) *crassicornis* Richardson.
Bison (*Platycerobison*) *chaneyi* Cook.
Bison (*Platycerobison*) *geisti* Skinner and Kaisen.
Bison (*Platycerobison*) *alaskensis* Rhoads.
Bison (*Gigantobison*) *latifrons* Harlan.

Specific and subspecific determination of *Bison* are based upon characters of male skulls.

Of special interest to the archaeologist is the discussion of *Bison occidentalis* Lucas, and *Bison antiquus* Leidy, since, "evidences of early man, or the Folsom and Yuma cultures, in the form of artifacts, have been found in association with both." The two species are distinct and easily separable by characters carefully pointed out and illustrated by the authors. Synonyms of *Bison* (*Bison*) *occidentalis* Lucas are *Bison kansensis* McClung, *Bison texanus* Hay and Cook, *Stelabison occidentalis* Figgins, and *Stelabison occidentalis francisi* Figgins.

Bison preoccidentalis from the late Pleistocene deposits near Fairbanks and Kotzebue Sound, Alaska, is considered as the probable progenitor of *B.* (*Bison*) *occidentalis*, the type of which was also found in Alaska near Fort Yukon, but probably in later sediments. *B. occidentalis* is considered as the progenitor of *B. bison athabascae* and *B. bison bison*. Late Pleistocene is defined, page 132, "as the middle of the Illinoian to inception of the Wisconsin." From this study it is evident that the forms of the subgenus *Bison* are closely related, constituting apparently a phylogenetic lineage, that is a series of both vertical and horizontal subspecies that slowly shifted their home ranges during the closing phase of the Ice age in response to shifting environmental conditions.

"The common range of *Bison occidentalis* and *antiquus* was the plains of central North America. It appears that *occidentalis* was a later arrival on the plains of North America than *antiquus*, but was the successful surviving species that gave rise to the recent plains bison."

Synonyms of *Bison* (*Simobison*) *antiquus antiquus* Leidy are *Bison californicus* Rhoads, and *Bison pacificus* Hay. Synonyms of *Bison* (*Simobison*) *antiquus figginsi* (Hay and Cook) are *Bison taylori* Hay and Cook, *Stelabison occidentalis taylori* Figgins (1933), *Bison oliverhayi* Figgins, and *Bison antiquus barbouri* Schultz and Frankforter.

In regard to the development of *Bison antiquus* it is best to quote from the authors, "*Bison* (*Simobison*) *alleni* Marsh, was one of the middle Pleistocene bovid emigrants from the old world that left no record of its passage through Alaska, probably living contemporaneously for a time in North America with *B.* (*Gigantobison*) *latifrons* and *B.* (*Platycerobison*) *chaneyi*. Evidence suggests that the descendants of *alleni* were subjected to the same process of retrogressive horn-core growth observed in the line of retrogression in *B.* (*Bison*) *preoccidentalis*, *B.* (*B.*) *occidentalis* and *B.* (*B.*) *bison* (Pl. 14). In case of *alleni*, the descendants appear to be the species of *B.* (*Simobison*) *antiquus* which has many of the regressed attributes of *alleni* (compare Pls. 15, 16)."

Bison (*Platycerobison*) *chaneyi* Cook is considered as the earliest known bison from early Pleistocene deposits of North America. *Bison crassicornis*, *B. geisti*, and *B. alaskensis* are all late Pleistocene forms known only from Alaska or Alaska and northern Canada. Maps showing the known distribution of the extinct and recent bison of North America are given.

One chapter is devoted to methods, under which are discussed terms used, definitions of horn-core indices, the standard use of the comparative views and scales employed in the text, also illustrated cranial measurements, all of which, if carefully studied by students working on bison, would help to standardize such work. A system of wear classification for the teeth of *Bison* has been carefully worked out, described, and illustrated by 90 figures. The tooth wear, or individual age, has been correlated with cranial characters.

Conclusions are also given in German and French. This

study was made possible by Mr. Childs Frick's interest in Vertebrate Paleontology through his maintenance of the Frick Laboratories for the advancement of knowledge in this field of science.

CLAUDE W. HIBBARD
University of Michigan
Ann Arbor, Michigan

Papers of the Michigan Academy of Science, Arts and Letters, Vol. 31 (1945), Pt. 3, General Section, pp. 193–324. Ann Arbor: The University of Michigan Press, 1947. $1.75.

In this volume there are three anthropological articles:

The Beale-Steere Collection of Pottery from Marajó Island, Brazil. BETTY J. MEGGERS. Pp. 193–213, 4 plates.

A small collection of pottery at the University of Michigan has been analyzed in terms of modern ceramic concepts. Eleven pottery types, two adorno types, two figurine types, and a single category of *tangas* are defined. This is a rather large series of forms considering the few specimens (48 in all), but a survey of other collections showed this series to be representative.

Evidence from various writers, including the collector, indicates the possibility of stratigraphy in some of the Marajó mounds. However, there are not as yet sufficient data to place these types in any ceramic sequence.

Spatial distribution has been indicated by comparisons with the scant material available from the rest of the Amazon Basin. The other ceramic center, Santarem, is strikingly different, but throughout much of the Amazon occasional vessels are found which indicate some relationship to Marajó styles.

The author favors an early dating for the Marajó styles relative to Santarem styles, as opposed to Nordenskiöld's early date for Santarem. The latter was apparently based upon typological inference, and it is contradicted by the typological history which Irving Rouse has worked out in an adjacent area, the West Indies. It seems probable that Megger's and Rouse's suggestions of an earlier date for Marajó are more correct.

Ethnographic Notes on Sandia Pueblo, New Mexico. LESLIE A. WHITE. Pp. 215–222.

This brief account constitutes the largest single published paper on Sandia. The information was gathered some years ago by Dr. White incidental to Keresan field work.

The major section of the article is concerned with the various secular and religious officers of the pueblo, in connection with which some ceremonial and miscellaneous information is given. One question raised, that of the presence of masked dances, can be resolved with unpublished data at the reviewer's command. Such dances do exist, and on at least one occasion four different masked dancers performed.

It is unfortunate that all other published material about Sandia pueblo was not incorporated in this paper, or at least cited, for it would be valuable in view of the scarcity of data to bring together all available information. Perhaps further work will be done here by other workers, since the pueblo offers some interesting problems. Many apparent anomalies in the culture suggest that the Sandia people borrowed certain traits from the Hopi during their long sojourn in that country in the seventeenth and early eighteenth centuries.

Notes on the Ethnozoology of the Keresan Pueblo Indians. LESLIE A. WHITE. Pp. 223–43, 8 figures.

This is the latest of a series of papers on specialized aspects of Keresan culture. Like the others it helps to round out the general picture, and it will serve as a zoological glossary for other workers.

The following topics are considered: Birds, Mammals, Reptiles and Amphibians, Fish, Mollusks, and Insects. Under each heading a brief synopsis is presented of the uses of the various animals and their position in Pueblo life and folklore. A Keresan list is then given for all the identified species with notations as to various dialectic or other linguistic differences.

JOHN M. GOGGIN
Peabody Museum
Yale University
New Haven, Conn.

Tihuanacu, the Cradle of American Man, Vols. I and II. ARTHUR POSNANSKY. New York: J. J. Augustin, 1945.

Volume One contains 158 pages, 20 figures, and 64 plates. It is basically a reprinting of *Eine Praehistorische Metropole in Südamerika* (Berlin, 1914) with parallel text in English and Spanish rather than German and Spanish. Although the Preface states that the present volume is a thorough revision of the earlier one, the changes are minimal. Chapter Five of the first edition, on craniology, has been omitted in the second; a third period for Tihuanacu is added, by name only, in Chapter Seven; two designs originally called "Male Sex" and "Female Sex" have been renamed "Earth and Sky" and "Moon House" in Chapter Ten. The plates and figures are identical with those in the first edition, although of noticeably poorer quality of reproduction. In brief, Volume One needs no review since nothing scientifically new has been added. The reason for reprinting a volume already well known to scholars and generally available in libraries is difficult to comprehend.

Volume Two contains 246 pages, 180 figures, and 8 plates. The illustrations are even more numerous than this because of extensive use of *a*'s and *b*'s. This volume adds greatly to our knowledge of the Tihuanacu site. Each construction unit is described in detail and illustrated by photographs, plans, and drawings. The plates include a contour map of Tihuanacu and detailed ground plans of Calasasaya, the Palacio, Kantataita, Puma Puncu, and Akapana.

The copious illustrations of Tihuanacu stone carvings are of particular interest. The reviewer in his "Excavations at Tiahuanaco" (*Anthropological Papers, American Museum of Natural History*, Vol. 34, Pt. 3, pp. 460–3, New York, 1934) catalogued 42 pieces of stone carving from Tihuanacu. Posnansky illustrates many of these, as the following check list indicates:

Bennett	*Posnansky*
No. 1	Figs. 106–110
No. 2	Figs. 113–117
No. 3	Fig. 126

Bennett	*Posnansky*
No. 4	Fig. 111
No. 5	Figs. 99–102
No. 6	Fig. 104
No. 7	Fig. 103
No. 9	Figs. 105–107
No. 11	Figs. 132–133
No. 12	Fig. 129
No. 13	Fig. 128, *right*
No. 14	Fig. 128, *left*
No. 16	Fig. 21
No. 17	Fig. 137, *right*
No. 19	Figs. 138–139
No. 22	Figs. 86*a*–86*b*
No. 23	Fig. 86
No. 24	Figs. 87–88
No. 25	Fig. 137, *left*
No. 26	Figs. 122–124
No. 28	Fig. 125, *right*
No. 35	Fig. 150
No. 40	Figs. 152–153

In addition, Posnansky shows clearly that the carving No. 39 is the head of No. 9. He also illustrates (Fig. 22) three relief heads which should form a fifth subdivision of No. 32, "Stone heads." Several new carvings are shown which might, for convenience, be added to the numerical list as follows:

No. 43 (Figs. 57–59). Fragments of a gateway at Puma Puncu with decorative frieze like the one on the base of the "Gate of the Sun."
No. 44 (Figs. 60–61). Block with relief figure like the central one on the "Gate of the Sun."
No. 45 (Fig. 121). Kneeling animal figure.
No. 46 (Fig. 125, *left*). Kneeling animal figure.
No. 47 (Fig. 130). Part of a double statue. A general view of the La Paz museum (Fig. 131) shows three more parts of double statues.
No. 48 (Fig. 134). Black stone statue.
No. 49 (Fig. 135). Black stone puma.
No. 50 (Fig. 136). Geometrically carved animal.
No. 51 (Fig. 140). Carved lintel.

The range of Tihuanacu design is further illustrated by pictures of decorated blocks with both geometric and figural designs (Figs. 141–151). Carvings from other sites are also included. Two pillar-type statues from Jesús de Machaca (Figs. 89–90) show interesting variants on Tihuanacu design motifs. Three complete and one fragmentary statue from Pokotia (Figs. 91–96) are attributed to the first Tihuanacu period. These are kneeling figures, carved with considerable realism. One is represented as playing a flute. Finally, two small statues from Wakullani on the shores of Lake Titicaca are shown (Figs. 97–98).

Volume Two is, then, mainly a descriptive record of the ruins of Tihuanacu, and as such is of great value. The interpretative sections involve identification of design symbols and estimates of age based on astronomical observations. Posnansky thought that Tihuanacu was a solar observatory, built with such accuracy that any deviations from the sun's present orbit could be used for dating. Such calculations were possible even though Posnansky argued that Tihuanacu flourished when the altiplano, now over 12,000 feet in altitude, was still near sea level, and that the great temples were destroyed by a cataclysm. The age of the second period at Tihuanacu is estimated by Posnansky to be 15,000 B.C. Other types of evidence, such as weathering, associated extinct animals, and fossilized bones, are used to confirm this great age. Neither the evidence nor the conclusions are presented in a manner acceptable to scientific archaeology.

The late Professor Posnansky had little interest in archaeology as such. He was a man of action who devoted a major part of his life to examining, describing, and defending Tihuanacu. His bibliographic citations show little awareness of publications other than his own. It is impossible to discover from these two volumes whether the author himself did any excavating, but in any case he had no interest in stratigraphic study. He lived a life of intellectual isolation. He developed no students to carry on his work, nor did he enjoy the competition of other scientists in his favorite region. His great contribution lay in his zeal for describing and preserving the monuments of Tihuanacu.

The announcements of the present work mentioned a third volume on Tihuanacu ceramics. Posnansky had assembled numerous drawings to illustrate this, and some of the color plates were supposed to have been prepared. Since so few examples of Tihuanacu pottery have ever been illustrated it is earnestly hoped that Professor Posnansky's death will not prevent the publication of the final volume.

W. C. Bennett
Department of Anthropology
Yale University
New Haven, Conn.

Maya Explorer, John Lloyd Stephens and the Lost Cities of Central America and Yucatan. Victor Wolfgang von Hagen. Norman, Oklahoma: University of Oklahoma Press, 1947. 324 pages, 56 illustrations.

This is an interesting and readable biographical study of John Lloyd Stephens. Born in Shrewsbury, New Jersey in 1805, he moved with his family to New York City a year later. He received his A.B. at Columbia College and studied law in Litchfield, Connecticut. A wanderer at heart, he toured the Illinois prairies in 1824 and sailed down the Mississippi to New Orleans.

He practiced law in New York from 1825 to 1835. Then wanderlust carried him to Europe, Egypt, and Arabia for two years. As a result he published two books, *Incidents of Travel in Egypt and Arabia Petraea* and *Incidents of Travel in Greece, Turkey, Russia, and Poland.*

In the early 1840's Stephens made two extended trips into the then relatively unknown portions of Central America. While he went as United States ambassador to the Government of Central America his foremost interest was in exploring the ruined cities of the Maya. Following these trips he wrote two delightful and enlightening books, *Incidents of Travel in Central America, Chiapas, and Yucatan* and *Incidents of Travel in Yucatan.* In these four volumes, admirably illustrated by Frederick Catherwood, Stephens reached the height of his literary career. In 1848 he was instrumental in securing the option to build a railroad across the Isthmus of Panama and in 1850 he was elected President of the Panama Railway Company. He died in New York City, October 5, 1852.

Von Hagen has given thought to the selection of his material. The illustrations are well chosen and with two exceptions credit has been given. These two are panoramic drawings by W. H. Holmes, which appeared in his *Archaeo-*

logical Studies among the Ancient Cities of Mexico as Plates IX and XXV published by the Field Columbian Museum in 1895 and 1897.

To readers of AMERICAN ANTIQUITY the half of the book devoted to restating Stephens' account of travels in Central America will be of first interest. From necessity much is omitted, and as is inevitable much of the spontaneity is lost in the retelling. However the book is well presented and should meet a popular demand with the renewed interest in a prominent man and able writer of the last century.

KARL RUPPERT
Carnegie Institution
Cambridge, Massachusetts

Contributions to American Anthropology and History, Vol. 8. Publications, Carnegie Institution of Washington, No. 546. Washington, 1943.

This volume contains the following papers:

No. 40, *The Archaeology of Southwestern Campeche.* E. WYLLYS ANDREWS. Pp. 1–100+25 pages of drawings and photographs;

No. 41, *Explorations in the Motagua Valley, Guatemala.* A. L. SMITH AND A. V. KIDDER. Pp. 101–182+58 pages of maps, drawings, and photographs;

No. 42, *The Astronomical Tables of the Maya.* MAUD WORCESTER MAKEMSON. Pp. 183–221, with one drawing, 17 tables;

No. 43, *The Mercado, Chichen Itza, Yucatan.* KARL RUPPERT. Pp. 223–260+36 pages of drawings and photographs, including 2 rendered restoration drawings by Tatiana Proskouriakoff.

Preprinted separates of these papers all bear dates in 1943. They form the latest volume of the series of separately numbered *Contributions* initiated under A. V. Kidder as Chairman of the Carnegie Institution's Division of Historical Research. The present title differs from that of the first four volumes, which was simply *Contributions to American Archaeology*. The change perhaps reflected some still-current soul-searching as to the actual and desirable goals of Archaeology in the Americanist field. Labels aside, the series has always been devoted to research on men and their cultures in Middle America, and has not been limited entirely to staff members of the Institution. While heavily weighted with Maya archaeology proper, studies utilizing the data and techniques of other disciplines have not been excluded.

Maya epigraphy, on the inferential as well as on the level of observed fact, was included from the first. The paper by Makemson, the Vassar astronomer and author of a work on Polynesian astronomy, falls under this head. She enters a field new to her, hence with the tremendous advantage of a fresh viewpoint and the ability to turn a skeptical eye on a gradually accumulated body of accepted ideas, some of which may really be unproved dogma. In this paper, however, there is a primary assumption that the Thompson "11.16.0.0.0" correlation is correct. It should not be read without also considering a later study by the same author, in which she proposes a new "12.9.0.0.0" correlation of her own (*The Maya Correlation Problem*, Poughkeepsie, 1946).

The other three papers are more strictly archaeological. Ruppert reports the excavation and partial reconstruction of an exceedingly interesting and important single building of the Mexican period at Chichen Itza. In it, among other things, the Maya art of roofing with the masonry vault reached its apogee. The paper is largely, but not entirely, descriptive. Obviously, the job was well done, the description beautifully complete.

In the papers by Andrews and by Smith and Kidder, we have discussion and evaluation of the data on a considerable scale. Important new facts reported may in each case be said to result from single field trips of the "survey" sort, and in each case the area chosen was little known and strategically important. Both expeditions and these reports on them fit into a forward-looking general plan.

The region covered by Andrews is much the larger of the two, and may be visualized on an ordinary map as hinterland of the Laguna de Terminos, lying east and south of that large break in the Gulf Coast near the westerly base of the Yucatan peninsula. The sites lie inland from the ancient *Acalan*, a province of coastal margin and perennially inundated areas coextensive with northern Tabasco. They are in a belt of heavy rain forest, or, still further inland, in a lacustrine zone with much uninhabitable swamp. The sites Pustinich and Cilvituk lie in these two zones, respectively, and appear also on an informative map of the whole of the northern Maya area published by Thompson in this journal (AMERICAN ANTIQUITY, Vol. 11, No. 1, p. 2).

The investigations of Smith and Kidder were near Acasaguastlan, in the middle of the Motagua Valley, which thrusts a long, narrowing finger of low country southwest from the Caribbean somewhat east of the base of the peninsula, and cuts far into the Guatemala highlands. At Acasaguastlan it is hemmed in by high mountains to north and south and, though still low, the valley is semi-desert except for irrigable bottom lands. So far as topography is concerned, contacts with the famous Classical ("Old Empire") sites Quirigua and Copan would have been easy, and a break in the mountains gives access to the drainages of the Negro and Polochic rivers in the Departments of Baja and Alta Verapaz. This enterprise turned into a two-months dig at Guaytan, hard by Acasaguastlan, with only ten days to spare for surface investigation of the surrounding territory.

Most of the textual matter of the volume consists of clear reproduction of typescript with little if any reduction in size. The quality of the illustrations is excellent, and they are generous in quantity. Makemson, who had little need for illustrations in the narrow sense of the word, sets a new standard in the number and, in most cases, the completeness of her tables, which have a similar function. Some remarks on the individual papers are appended below.

No. 40 (Andrews). About a quarter of this paper is devoted to "Geography and Human Ecology," and "History and Exploration," and somewhat less than half to site-by-site descriptions. The latter are numerous, many necessarily being short notes. The most northerly site is Pustinich, about 40 kilometers southeast of Champoton on the coast. Moral, the most southerly, is about the same distance north and slightly east of Tenosique. The others are assigned to four geographically determined sub-groups

lying more or less between these extremes. With Moral, Andrews adds a new Classical Maya site of very considerable size, but with none of its architecture showing. However, he discovered a stela, elaborately carved on four sides, which is here fully published so far as this can be done with photographs and an ink rubbing. The Initial Series date is read as 9.16.5.0.0, the moon number unexpectedly higher by one moon than would be calculated in the "Uniformity System" in vogue to the south and east at this time. At Cilvituk, 150 kilometers to the northeast, intensely interesting data respecting architectural technology were recovered. Here building walls occur which certainly, not probably, failed to reach roof height, and there are satisfactorily preserved portions of others roofed with beams and mortar. At Tiradero, close to the more southerly Moral, there is an enormous pottery dump.

In the discussion of surface sherds collected, some use is made of opinions of George W. Brainerd who, I understand, is in process of publishing a general study of the ceramics of Yucatan. He was unable to read Andrews' manuscript, but suggested certain emendations of the text as it deals with ceramics, after it appeared. These are mimeographed and bound in with the volume, but may be lacking in preprints. Detailed description and illustration of the pottery presumably has been left for Brainerd's forthcoming more extensive study.

Andrews here supplies a 26-page "Comparative Study" in which ceramics, art, architectural technology as well as style, and aboriginal codex materials are utilized. It leads to a discussion of dating problems, and includes an addendum or "Note" of special interest. Here is some further discussion of a complex of crude non-Maya Yucatecan sculptures in which the author has interested himself before, further examples having been found at Cilvituk. He is inclined to the view that they have a stylistic affinity with the colossal heads of the La Venta ("Olmec") culture further west, and that both are late, not early. While in Mexico City he examined the famous Stela C of Tres Zapotes but could not see the supposed traces of a dot, by which Stirling fortifies his reading of 7.16.6.16.18 in the Maya count. Andrews inclines to agree with Palacios' reading of 9.15.6.16.18, if the number is counted from the Maya base at all. A short chapter brings the results of the comparative study to bear on the specific question of day-for-day correlation of Maya and Christian chronologies. His discussion seems to assume that either an 11.16.0.0.0 or an 11.3.0.0.0 correlation must be correct, though in 1940 he urged serious consideration of a correlation hypothesis which denies the validity of the 260-year yardstick which gives us the interval between these Maya date possibilities for a time of the conquest.

No. 41 (*Smith and Kidder*). A 7-page "Introduction" provides geographical, linguistic, and historical orientation. Coming to the results of the field work, "Middle Motagua culture" is used as a new label. Almost all its sites are on dry terraces overlooking fertile river valleys, with a few noted in the vegetation-choked bottoms. The map shows that these valleys are short tributaries of the Motagua itself, and the great majority of plotted mounds are less than 4 km. from the main stream, on either side. Sixteen hundred mounds were noted, 1000 of them within an area having a maximum diameter of about 8 km. The label applies to the culture of the main valley floor, and excludes remains in the neighboring mountains on the north. Two of several reported sites there were visited, and architecturally they are said to resemble Rabinal in the Baja Verapaz.

The bulk of the report describes the excavations and artifacts encountered at Guaytan, which becomes a type site for the Middle Motagua culture. Four main types of structure were identified by excavation: ball courts, platforms with thin-walled buildings, a multi-chambered building with thicker walls (like Classical Peten "palaces" in plan), and burial mounds covering vaulted tombs. Large pyramids are absent, and there is a minimum of careful assemblage.

The tombs are apparently very plentiful. The vaulted roofs are crude, being formed of large slabs with boulders as counter-weights on their inner ends. There is an entrance closed by a removable slab. The tombs contain multiple burials, apparently made from time to time. The binder in all stone masonry observed at the site is adobe, without burned lime. Considering this, and the dimensions of the comparatively heavy-walled "palace," it would seem to the reviewer that that building must have been roofed with beams and adobe, or else with thatch, and that vaults on free-standing walls were probably unknown here. However, the authors suggest the possibility of the vault on this building. It had been partly demolished in ancient times, the evidence gone. If vaulted, without the strengthening factor of burned lime, I think we should have to rate it as one of the most striking achievements of aboriginal American engineering.

The pottery, coarse as well as fine wares, is thoroughly illustrated and analyzed, along with other objects. A single piece of metal, possibly traded from Colombia or Panama, came from a sealed tomb containing a non-effigy plumbate sherd. Tortilla-griddles, absent in Classical Peten sites but present at Copan, appear here in abundance and in all deposits.

In the final chapter of "Discussion" two as yet incompletely definable ceramic periods are set up. "Lato" seems to correspond temporally with Esperanza in the highlands and with Tzakol in the Peten lowlands. A time-gap is suspected between this and "Magdalena," which latter seems to postdate the Peten stela cult because of its association with metal and plumbate. Further excavation should show a pre-Lato horizon, since a few pieces of Usulutan ware were found, probably not in original position.

There are no carved stelae here, though apparently there were some plain ones, which are not illustrated or described in detail. The authors incline to the view that, to the extent that the site may show Classical Maya traits, it does so because of parallel evolution from a postulated "archaic parent."

No. 42 (*Makemson*). It seems to me that this paper should receive careful examination in a special article in which the author's subsequent thesis, already referred to, can be examined in connection with it. I will note, however, that one of the soberest and most competent of Mayanists has proceeded to reason on the assumption that in this paper Dr. Makemson had finally settled the correlation

problem in favor of the Thompson 584,285 constant. (R. C. E. Long, "The Venus Calendar of the Aztecs," No. 46 in the Carnegie Institution's series of *Notes*, 1944.) Dr. Makemson was careful to avoid a definite claim to that effect—but if she did not intend to make the horse drink, she certainly led us to the very brink of the water. This papers seems to remove the astronomical objections to the Thompson thesis. The more recent paper does the same thing for a 12.9.0.0.0 correlation, in the process reverting to orthodox Maya datings for the Codex tables and changing Spinden's constant by only 246 days.

Lest the foregoing seem to imply reproach at so quick a shift in the manner of applying the astronomical approach to the problem, I had better state flatly that I think it is just such flexibility of mind which is needed. However, the possibility of such shifts in interpreting the Codex data must be eliminated, item by item, before archaeologists can safely take any correlation as definitely and finally settled by astronomical tests, and use it as a final check in calibrating their own ceramic and other yardsticks in terms of years.

No. 43 (*Ruppert*). The "Mercado" belongs to a special "gallery-patio" type of Maya building, thus far known only at Chichen Itza and in the Mexican period. It must have some specialized function. This example was excavated in 1932. For comparison, partial plans of the five unexcavated buildings of the type are given, with notes. It is suggested that the plan-type results from Mexican influence, as some of the stylistic details certainly do. Mitla is mentioned in this connection.

The porch-like gallery of the Mercado is about as open and public a construction as one could contrive, except for its elevation of about 2 m. above the plaza on which it faces (the "Court of the Thousand Columns," a probable market place). Through a centered doorway in the rear wall one enters a roofed "ambulatory" which forms a hollow square about a small sunken court, the patio. On the inner sides the roof is supported only by slender columns: on the outer sides by unbroken walls, except for the single entrance from the gallery. In contrast, the ambulatory and patio are as secluded as possible. No permanent "furnishings" were found in the excavated half of this rear unit, but a bench with backrest runs along the whole wall of the gallery, and there was an additional special dais, with backrest, carved and painted, near the door. The latter recalls certain sure or probable thrones in some Classical Maya palaces; and those buildings are often grouped with an eye to partial seclusion.

The excavation provides us with unique data on roofing technique. The single vault over the gallery has the greatest span yet reported, 4.52 m., yet on the front its thrust is met by slender columns 2.50 m. high. One wonders if expert study would not lead to the conclusion that the many vault beams shown in the restoration must have acted as tie-rods. For the ambulatory even greater span and height were evidently required; hence, one supposes, the resort to thatch roofing here. Various bits of evidence show this, apart from the dimensions themselves. The columns averaged 4.75 m. in height, the span close to 7.00 m. Alternative thatched roof reconstructions are provided.

LINTON SATTERTHWAITE
University Museum
University of Pennsylvania
Philadelphia, Pennsylvania

Resumen del informe de las exploraciones en Oaxaca, durante la 7a y la 8a temporadas 1937–1938 y 1938–1939. ALFONSO CASO. Vigésimo-Séptimo Congreso Internacional de Americanistas, Actas de la Primera Sesión, Celebrada en la Ciudad de México en 1939, Tomo 2. México: Instituto Nacional de Antropología e Historia, Secretaría de Educación Pública, 1947. Pp. 159–87, 23 figures.

Dr. Alfonso Caso's publication is beginning to fill a gap which has been badly felt by all students of Mexican and Middle-American archaeology. Since his publication of the 5th and 6th seasons, at Oaxaca, which appeared in 1938, no additional reports have been available, despite the fact that excavations at Monte Albán were continued regularly each year. Only very occasionally have some outstanding findings been made known.

Now, at least, we possess Caso's report on the 7th and 8th season which took place in 1937/38 and 1938/39. Considering the importance of the site, archaeologists would certainly welcome publication of the reports of the more recent excavations at an early date.

The places studied by Caso were Monte Negro and Yucuñudahui in the Mixteca; Monte Albán, Atzompa, and Mitla in the valley of Oaxaca. As is natural the greater part of his paper is devoted to Monte Albán. One cannot say that the findings made during these excavations will lead to any revolutionary ideas, but they are full of interesting details showing the richness of Indian life at this place and they all fit into the well-known scheme of five periods previously advanced by Caso himself. I should like, however, to emphasize one of Caso's new conclusions, as he establishes an interesting relationship between Monte Albán and Mitla. Translated into English, it reads: "There is nothing in Mitla which is not also found in Monte Albán, even though it may appear in the latter in a more simple form, which goes to prove that Monte Albán was the place from which came the elements which later on were to form the characteristics of Mitla."

Carefully selected illustrations enhance the value of the paper. Unfortunately their reproduction is not at all good. This fact is especially deplorable in the illustrations containing inscriptions, as in Figures 12 and 14. A clear reproduction of the stela corresponding to Figure 12 would have been particularly advisable, since Caso considers this inscription as probably being prior to the inscriptions of the Maya Old Empire. The reader will likewise miss illustrations of the newly found glyphs referred to on page 174 and of the paintings of Tombs 112 and 119 which are described in the text as: "Restos de pinturas bastante conservados para permitir obtener dibujos inteligibles de ellas."

As to the excavations in the Mixteca, only little work was done at Yucuñudahui, where a wooden lintel with a carved glyph was found. It presumably corresponds to the

TABLE 14. CASO'S CHRONOLOGICAL SCHEME

Mixteca	*Monte Albán*	*Valle de Mexico*	*Zona Maya*
Las Pilitas (Chachuapan) Tilantongo)	Monte Albán V	Azteca (Cholula)	Yucatán (Reocupación Maya)
(?)	Monte Albán IV Monte Albán III-b	Mazapan Teotihuacán IV	Yucatán (Chichén Itzá)
Yucuñudahui (Tumba 1)	Monte Albán III-a	Teotihuacán III	"Imperio Viejo"
(?)	Monte Albán II	Teotihuacán II Teotihuacán I (?)	"Q" Complex (Holmul I)
Monte Negro	Monte Albán I	Arcaico (Ticomán) Arcaico (Zacatenco)	Arcaico (?)

epoch of Monte Albán III. More attention was paid to Monte Negro, a site which Caso had discovered during the previous (6th) field season. The whole material now obtained at this place proves it to be archaic.

On the strength of his excavations Caso presents the time-table shown here as Table 14. He still adds the following: "Por la tabla anterior, se ve que todavía no encontramos en la Mixteca, la cerámica que corresponde a las épocas II y IV de Monte Albán."

This scheme looks highly convincing and since the time when it was propounded by Caso at the Congress of Americanists in 1939 it has been used with occasional modifications by other students. Nevertheless, to me it seems oversimplified and its indiscriminate use may lead to disturbing statements, such as would probably never have Caso's approval.

The origin of such possible misunderstanding must be looked for in the varying interpretations of "Monte Albán Roman Number." Among anthropologists there is no uniformity in the use of this terminology: it is either used as denoting a cultural complex existing in Oaxaca regardless of time, or as a chronological value sometimes referred to a pure Monte Albán site chronology and at others to a more generalized "Oaxaca" chronology.

The case is particularly acute with M.A. IV and M.A. V. In the scheme shown in Table 14, "Monte Albán Roman Number" is apparently used to indicate the duration of the respective cultural complex at Monte Albán itself. According to this scheme M.A. IV ended—always speaking approximately—at the same time as the Mazapan complex in the valley of Mexico. Since the end of Mazapan hardly can be put later than 1250, this would imply that M.A. V (on the hill of Monte Albán) must have started about this date, at the latest. As M.A. V is generally recognized as belonging to the Mixtec culture and as the fights between Mixtecs and Zapotecs (these latter identified by Caso as responsible for M.A. III and M.A. IV) are well known, we then would have to assume that Monte Albán hill had been conquered by the Mixtecs at least as early as 1250. Caso[1] precisely explains the presence of the Mixtec cultural complex (viz., M.A. V) at Monte Albán with a previous conquest of the hill by the Mixtecs and, relying on historical information, he maintains that the conquest of Monte Albán took place "in the last years of pre-Spanish history," that is to say, probably not much earlier than 1450.

Therefore, if we accept the statement of the scheme at face value, which lets M.A. V, at Monte Albán hill, begin at the end of the Mazapan culture, it can hardly be reconciled with the historical data. Moreover it is not likely that the Mixtec culture came to birth at the very moment when the Mixtecs took over Monte Albán hill.

It is much more likely that the Mixtecs had developed their culture long before they conquered Monte Albán and hence I would suppose that M.A. V cultural complex (or its general characteristics) appeared *in the Mixteca*, say, by 1250, especially as there are remarkable similarities between M.A. V and those of the "Azteca" and "Cholulteca" ceramics which are known generally as post-Mazapan, and that it was not brought to Monte Albán hill before the fifteenth century. Correspondingly we would also have to advance the end of M.A. IV on Monte Albán hill to, say, 1450 and in the Zapotec region, near Monte Albán not conquered by the Mixtecs, practically until the arrival of the Spaniards.

In other words, M.A. IV and M.A. V must be considered as having co-existed, though probably not on Monte Albán hill itself, although M.A. IV has presumably started earlier than M.A. V. (According to my notes of Dr. Caso's lectures held at the National University of Mexico in 1939, Caso himself maintained the survival of M.A. IV until the Conquest.)

If we were to suppose that with the appearance of M.A. V, M.A. IV died out, this would mean that the Zapotecs, bearers of M.A. III and IV, who were still holding a considerable kingdom when the Spaniards arrived, would have

[1] Alfonso Caso, *Cultura Mixteca y Zapoteca*, México, 1941.

shifted by about 1250 to another culture complex markedly different from M.A. IV. As far as I know no such late specific different Zapotec culture complex has been found and although it is true that so far no large excavations in pure Zapotec territory (apart from Monte Albán) have been carried out, I should think that, nevertheless, archaeologists should have come across it, even if only through surface collections.

I believe the foregoing deductions show how the analyzed scheme should be amended. After this amendment the scheme would seem to be more in accordance with our present knowledge of Zapotec and Mixtec archaeology.

We have seen above that for the Mixteca Caso has so far only found the following sequence expressed in Monte Albán culture complex terms:

M.A. V
M.A. III
M.A. I.

and that he is expecting to find intermediate ceramics in the Mixteca also. It is of course possible that they may have occurred. But on the other hand they may not and I think we should not worry about their absence: we have already stressed the fact of the contemporaneity of M.A. IV and M.A. V, and as to M.A. II, this seems to have been an intruder of short duration; coming from the south, it may easily have come to a standstill at the Mixtec mountains. One should also bear in mind that close to the northern border of the Mixteca Noguera has found at Calipan cultural sequences in harmony with the I–III–V pattern.

HEINRICH BERLIN
Mexico City, Mexico

Mexico South, the Isthmus of Tehuantepec. MIGUEL COVARRUBIAS. New York: Alfred A. Knopf, 1946. xxviii+427 pages, map, frontispiece, 93 plates, many black-and-white and 7 colored illustrations in the text. $7.50.

From its dust-cover, reproducing one of the author's inimitable paintings, to the last of the large collection of beautiful photographs by Rose Covarrubias, which closes the volume, this book is a joy to the eye. And its text is a joy to read. On the dust-cover it is stated that no one but a Mexican and no Mexican but Covarrubias could have written *Mexico South;* also that it is an outstanding work. For once a publisher's blurb is an understatement.

There has been, of late, such a clutter of half-baked books on Mexico and Guatemala, based on hastily gathered, superficial, and often misinterpreted information—I hasten to say that Mrs. Osborne's *Four Keys to Guatemala* is not one of these—that it is refreshing to have a picture of a country and its people by one who not only knows it intimately but also possesses the ability to mirror it with both pen and brush.

Mexico South treats of the archaeology, the post-conquest history, and the present-day life of one of the most interesting and, until now, least-known parts of Mexico, the Isthmus of Tehuantepec, from the Gulf to the Pacific. First is described the Gulf region: the oil-boom town of Minatitlan, the Popoluca, Zoque, and Huave Indians. There too are found the remarkable ancient remains known as Olmec or La Venta, the former name from that of the shadowy "Rubber People" whom legend assigns to the area; the latter from La Venta, greatest of the several sites at which Stirling has made such astonishing finds of Olmec carvings and tombs.

Following an archaeologically most important section on Olmec culture, of which more hereafter, Covarrubias crosses the Isthmus and devotes the remainder of the book to the Pacific littoral. This, to my mind, is as vivid, sympathetic, and penetrating a depiction of a piece of country, of its history, and of the life of its people as has ever been written. And the word picture is supplemented by a wealth of the author's delightful sketches and paintings and of his wife's superb photographs.

First are treated Tehuantepec and Juchitán, rival Zapotec capitals in ancient times, that have taken opposite sides throughout the turbulent post-Conquest history of Mexico and are still at odds on every question from the style of women's clothes to state and national politics. Tehuantepec, long the stronghold of the Creole landlords, is conservative; Juchitán intensely Indian, is unruly, progressive.

The chapter on the Zapotec heritage opens with an outline of the prehistoric period—mostly derived from Caso's researches at the highland site of Monte Albán but containing interesting material on the mountain fortress of Giengola, near the city of Tehuantepec. Then come the protohistoric wars with the Aztecs, the Spanish conquest, the Colonial, and Revolutionary periods. Throughout there glows Covarrubias' intensely democratic spirit, his sympathy for the underdog Indian and mestizo, his hatred of Spanish and Creole tyrants, of oppressive landholders, grafting *politicos*, foreign exploiters. After a résumé of the wars and revolutions that have torn the country through the centuries, he gives what he modestly terms a "glance" at the life of the Isthmus Zapotecs, but which is not only a satisfyingly detailed account of an ethnic group, but also a very keen appraisal of the inter-influence of Spanish and Indian social and material cultures, of Catholic and native religion. The chapter heads will give an idea of what is covered: The People, How They Look, Live, and Work; How They Think, Speak; How They Amuse Themselves; The Zapotec Family; Fiesta in Tehuantepec; Death and the Unknown. All are rich fare.

For archaeologists, the above-mentioned chapter on the Olmec is particularly significant. To that culture Covarrubias devotes a long and, for the archaeologist, a most important section, for whether or not one agrees with all his conclusions it must be admitted that his knowledge of Olmec antiquities and Olmec art is unequaled and that, himself an artist and student of art, he is uniquely well qualified to analyze, to compare, to discern trends and interinfluences. One cannot do better than quote his characterization of the strange Olmec sculptures.

"The early Olmec lapidaries excelled at making statuettes, masks, and great votive axes, generally representing squat, fat men with elongated, pear-shaped heads, small perforated noses, fat necks, heavy jowls, and stubborn chins. Their eyes are decidedly Mongoloid, almond-shaped or narrow slits between puffed eyelids. But their most char-

acteristic feature is a large despondent mouth with the corners drawn downwards and a thick, flaring upper lip like a snarling jaguar's. It is evident that these artists meant to represent a definite, traditional concept, a plump character with short but well-made arms and legs and with small hands and feet, either standing or seated cross-legged, Oriental fashion. They are generally shown nude and sexless, or wearing a simple loincloth or a short skirt with an ornamental buckle in front. There is always a strong feline feeling, coupled with a haunting infantile character and expression about their faces, as if they were meant to represent a totemic prototype, half-jaguar, half-baby, so characteristic and powerful that it is short of being an obsession. In fact, many of these sculptures are actually jaguars or, rather, a jaguar deity, perhaps a jaguar-cub ancestor, as so often their snarling mouths show toothless gums . . . . From an artistic point of view they are often among the finest works ever found on this continent; technically they are unsurpassed; and archaeologically they are a deep mystery because they present the dilemma of a most sophisticated art and a highly advanced technique belonging to the earliest known cultural horizon of the Mexican Indians."

Covarrubias' belief in the great antiquity of these remains is based on the occurrence of "baby-face" clay figurines in Archaic (Middle Culture) deposits at Tres Zapotes and Gualupita; on the Olmec characteristics of the jaguar mask on the famous Stela C at Tres Zapotes, which bears in bar-and-dot numerals the apparently very early date of 7.16.6.16.18; and the resemblance of that mask to those on the early Pyramid E-VII-sub at Uaxactum. He also considers that Olmec traits persist in the more florid Maya, "Totonac," and Teotihuacan sculptures of the Classic Period. Vaillant agreed with this hypothesis, as also, I believe, does Caso.

The opinion of such authorities must be given great weight. But the problem of Olmec dating is too important for our whole conception of Mesoamerican development to be considered finally solved. It could be argued that the "baby-face" figurines represent a proto-Olmec stage. Both S. G. Morley and J. E. S. Thompson hold that the Tres Zapotes date is not a contemporary one, or if it is that it was calculated from a beginning day much later than that of the Maya. Many typical Olmec carvings were in the great cache of jades found by Stirling at Cerro de la Mesas, which Drucker[1] assigns to the Lower II stage of that site and equates chronologically with Teotihuacan IV–V (I believe, however, that Teotihuacan III would be better). A jade figurine from a Tzakol horizon at Uaxactun has very definite Olmec affinities (but jades are unreliable time indicators because, being objects of great value, they might well have been treasured for centuries as heirlooms—witness the Leyden plate, bearing the earliest Maya date so far known, which was found in association with copper bells). Thompson[2] considers that the Olmec traits discernible in Classic Maya art are not survivals but are due to contemporary influence from a "going" Olmec culture. Drucker[3] is of the opinion that the La Venta site should be equated with Peten Tzakol (i.e., Early Classic Maya).

All in all, it seems to me that the extraordinary Olmec culture probably flowered from an already somewhat specialized Middle Culture stem at about the same time that the Maya, Teotihuacan, Tajin, and other Classic Mesoamerican cultures appear to have developed from other phases of Middle Culture. I think Drucker has placed it correctly in time and I agree with him that it existed in "marked cultural isolation," for while its influence looks to have been felt in the art of other areas and its small sculptures traveled far in trade, it seems to have received next to no stimuli from outside sources. The whole Olmec question is, however, still very much an open one and Archaeology is fortunate in having it under intensive study by so able and enthusiastic a student as Covarrubias.

A. V. KIDDER
Division of Historical Research
Carnegie Institution of Washington
Cambridge, Masaschusetts

[1] Philip Drucker, "Ceramic Stratigraphy at Cerro de Las Mesas, Veracruz, Mexico," *Bulletin, Bureau of American Ethnology*, No. 141, Washington, 1943, pp. 80, 87.

[2] J. Eric Thompson, "Dating of Certain Inscriptions of Non-Maya Origin," *Theoretical Approaches to Problems, Carnegie Institution of Washington*, No. 1, Washington, 1941.

Excavations at Kaminaljuyu, Guatemala. ALFRED V. KIDDER, JESSE D. JENNINGS, EDWIN M. SHOOK, with Technological Notes by ANNA O. SHEPARD. Publication, Carnegie Institution of Washington, No. 561. Washington, 1946. $7.00 paper, $8.00 cloth binding.

Lest AMERICAN ANTIQUITY subscribers who read Dr. Kidder's preview of the Kaminaljuyu excavations in the October, 1945, issue feel that there is no need for them to examine the final full report, let me say at once that at least two sections of this book are required reading. The "Introduction" and the "General Discussion" together comprise an informative and stimulating over-all consideration of Mesoamerican prehistory. *Excavations at Kaminaljuyu, Guatemala* is an important record of shrewd field techniques, painstaking artifact description, exhaustive comparative research, discerning analysis and interpretation.

Dr. Kidder makes it clear at the outset that Dr. Jennings and Mr. Shook contributed invaluable work both in the field excavations and in the comparative studies. If I seem to refer primarily to Dr. Kidder in this review, it is because the senior author wrote the introduction, which we shall summarize and consider more fully than the chapters of excellent description and comparison which made them possible. As for Miss Shepard's contribution, I trust that a ceramic technologist will review her valuable addition to the volume; I am one of the many archaeologists who must accept her results gratefully and without question, even though among her data are matters of apparently controversial nature.

The authors present the book in nine main sections: I, Introduction; II, Excavation; III, Architecture; IV, Tombs and Minor Graves; V, Discussion of Tombs; VI, Artifacts; VII, Pottery; VIII, Exterior Relationships as Indicated by Pottery and Other Artifacts; IX, General Discussion. As

[3] Philip Drucker, "Some Implications of La Venta Ceramics," *Smithsonian Miscellaneous Collections*, Vol. 121, No. 8, Washington, 1947.

one may guess from the titles, four of these sections are primarily descriptive, four interpretative. In the descriptive section on Excavation, a convenient preliminary summary of each mound enables the reader to skip the details if he wishes; this scheme might well have been carried a step further by reducing the purely descriptive passages and the detailed comparative sections to a smaller type face size, say 8- or 6-point, thus making it easier for students to segregate results from supporting evidence.

In the Introduction, Dr. Kidder summarizes briefly the general outline of Mesoamerican prehistory. With the exception of the early and pre-farming horizons, about which our prevalent notions are still disgracefully hazy, the results of this summary are encouraging. We seem to be reaching a point where Mesoamerican data can at last be of some use, however limited, in preliminary attempts to synthesize New World prehistory. This may well be due to the fact that the Kaminaljuyu findings help to fill in a large and relatively centrally located gap between local sequences previously established for parts of El Salvador, Honduras, the Peten and Usamacintla, southern and central Mexico, enabling Dr. Kidder to ink-in solid lines of chronological correlation where only tentative dotted lines existed before.

Although Tepexpan Man had not yet been discovered when the book went to press, this new find only makes more baffling the problem of what was happening in Mesoamerica during the millennia which geologists insist had passed between the first humans and the earliest dates which archaeologists are willing to assign to the first cultural remains of this area. After years of research where are our Mesoamerican pre-farming sites and artifacts? Dr. Kidder gropes for possible explanations, and believes that such remains will ultimately be found. In the meantime, however, our failure to find what has turned up in considerable quantities in North and South America is daily making more plausible the argument that higher civilization was introduced full-blown from another area, either South America or Eurasia or both.

In spite of its briefness, this introductory summary of Mesoamerican prehistory is most stimulating. Dr. Kidder's broad viewpoint frees him from the narrow confines of the "Archaic" sequence of the Valley of Mexico, the "Old Empire" sequence in the Peten, and the "New Empire" and "Toltec-Aztec" periods of Yucatan and Mexico; for this very reason one happily finds little use of the misleading designations we have placed in quotation marks, and instead is able to view Mesoamerica as a whole through more embracing terms: the Middle, Classic, and Late Periods. Viewed in this perspective, the Maya Culture becomes not "the trunk of the Mesoamerican tree, but merely . . . its most luxuriantly blooming branch," the trunk being the Middle Culture, the roots the unknown primitive farming or Early Culture.

Having reemphasized the far-from-primitive quality of the Middle Period remains, Dr. Kidder says that the Classic Period saw the elaboration of arts and crafts, intensified regional specialization, tremendous development of religious architecture (implying a growth of rich ceremonialism), attainment of economic conditions favorable to permit the diversion of labor to non-essential activities, and a close meshing of religious and civil authority.

Classic times came to an end in change and unrest. Were the fall of Teotihuacan, the alien domination of Monte Alban, the abandonment of the older Maya cities simultaneous? Dr. Kidder believes that these and many other questions, fundamental because on them depend anthropological interpretation and understanding of cultural dynamics, are chronological problems that can be solved only by painstaking and (to some critics) unduly slow archaeological excavations.

Kaminaljuyu, unfortunately given a Quiche name by Guatemalan scholars, turned out to be a good site to study, not only because of its extraordinarily rich tombs and architectural sequence, but because it spanned two of the main periods of Mesoamerican prehistory and possibly part of a third: the Middle (Miraflores remains), the Classic (Esperanza phase), and the Late (to which the authors assign their Amatle-Pamplona).

The Miraflores phase inhabitants of Kaminaljuyu were settled agriculturists who lived in wattle-and-daub dwellings, made very fine pottery (the general run of which was really superior to non-mortuary Classic pottery), hand-fashioned figurines representing pregnant females, dug bowl-like borrow pits and bottle-shaped storage pits, and buried their dead extended with funeral furniture of jade and pottery. Although no rich grave or formal tombs have been found, large mounds of that period imply a theocratic organization with sharply differentiated castes.

In treating of the development and distribution of Middle Culture remains in Mesoamerica, the authors discuss the Q-complex and the La Venta discoveries. They are inclined to agree with Lothrop and Vaillant that Q-traits were derived from an ancient culture underlying those of later times in Central America but not those in Mexico. They suspect that the Valley of Mexico Middle Cultures may not be as old as those farther south, the Valley being geographically peripheral to the total range of Middle Culture, and its earliest remains having possibly developed in Puebla, Oaxaca, or Veracruz. The last named prototype they consider a "more or less independent contemporary of a Q-dominated group of cultures in Central America."

The authors feel that the pattern of Mesoamerican life became fully established during the Middle Period. Formal ceremonialism had begun to play an important role, a theocratic caste was probably in process of formation, and the population had settled into a simple economic design similar to that which still exists.

It is with the succeeding Esperanza phase (Classic Period) that this volume is chiefly concerned. It was contemporaneous with Teotihuacan III, Monte Alban III, and Tzakol phase of Uaxactun. The authors believe that the Esperanzans spoke a Maya language, although the principal occupants of the rich tombs may have been a small group of warlike intruders who conquered Kaminaljuyu and ruled over its already resident population. While this suggestion has considerable supporting evidence, it must remain, as the authors state, a speculation until more is known of native highland culture and of Teotihuacan burial practices. The phase was one of cultural activity;

public works indicate a strong government. Kaminaljuyu may have been the "vacant-town" type of capital for an autonomous city-state. Priesthoods probably exercised great power. The authors are inclined to agree with Thompson's hypothesis that the influx of Mexican influence later caused a shift from religious valley centers to defensible fortress-towns, but that in the pre-Mexican period political or politico-religious groups larger than the city-state were powerful enough to have inhibited strife.

Esperanzan religion was polytheistic, gods having been added to an earlier local pantheon. Influence from Mexico was strong, that of the Maya less so. Ceremonies were elaborate and colorful, funerals pompous and attended by human sacrifice. The ball game flourished. Kaminaljuyu was a busy market center for local as well as foreign products.

As background for the above discussion, the authors assemble and analyze the significant data known today of Teotihuacan and its relations to both earlier and subsequent remains in Mexico. While they apologize for invading another field, their excellent analysis of other scholars' findings further convince this reviewer that an "outsider" can often get to the root of difficulties and problems more easily than one submerged in its material. The Amatle and Pamplona phases were later than Esperanza, materials from these two complexes being found in refuse beds covering the skirts of one mound and in pits nearby. The authors are not certain that Amatle-Pamplona followed immediately after Esperanza, but they suspect that this was the case, since "the two bear sufficient resemblance to Esperanza to warrant belief that they were considerably later representatives of the same ceramic family." In their report, the authors state that they found nothing which could surely be recognized as coeval with Tepeu, the later Classic phase of Uaxactun, but they think it probable that such material will ultimately come to light.

It seemed to me most likely that Amatle and Pamplona were contemporaneous with Tepeu, and that the lack of analogies was due to an end of close contacts with the Peten. I had been confronted with this same problem in the Zacualpa ceramic sequence, where it can be demonstrated that the pre-plumbate Pokom Phase developed out of Balam Phase (which, in turn, was coeval with Esperanza). Reference to Butler's Alta Verapaz sequence shows the same situation there, except that Butler's Period II contains some specimens much more definitely related to Tepeu. While I found few direct analogies between Pokom Phase and Tepeu, the pottery shared more general traits with Tepeu and with San Jose III–IV and Benque Viejo III–IV than it did with pottery of any other phase in the Classic Maya area. At both Zacualpa and the Alta Verapaz, plumbate and associated traits appeared without hiatus in the next period (Tohil Phase at Zacualpa, Period III in the Alta Verapaz).

My belief that Amatle-Pamplona equates with Pokom Phase, Alta Verapaz II, and Tepeu was based on the general Kaminaljuyu sequence rather than on an intimate familiarity with Amatle-Pamplona pottery. Therefore, I have just talked to Dr. Kidder about this point, and he tells me that after the book was in press he actually did find that Amatle-Pamplona equates with Tepeu.

I mention this in such detail because it is of considerable importance. If Amatle-Pamplona is contemporaneous with Tepeu, the Kaminaljuyu authors must reassign their Amatle-Pamplona phases, or at least the earlier of the two, to the late Classic Period if it is to conform with this designation as it applies in the Uaxactun sequence, and such a reassignment is of more than purely taxonomic significance. At Uaxactun, Tepeu culture, while late, was still Classic. At Zacualpa, the fact that the large structures of the main architectural assemblages were built during Pokom Phase would imply that this city was in its Classic Period at that time. At Chiche, a large site not far away, so far as one can judge from surface collections, building activity seems to have ceased in middle or late Classic; the Balam-Pokom Transitional. At Kaminaljuyu, on the basis of negative evidence (no large Amatle or Pamplona structures have been identified), opulence was on the wane.

Was the general unrest and change of which Dr. Kidder speaks in connection with the Late Period already making itself felt in widely scattered areas of the highland? Or was this merely a reflection of local changes in the balance of power and the rise and fall of prosperity in individual cities? In Guatemala, future studies of the extent to which varying cultural manifestations cross linguistic and national boundaries may take on more than purely academic significance.

Although effigy plumbate did not appear in the Kaminaljuyu excavations, the authors are inclined to accept a Kaminaljuyu provenience for certain specimens in private collections said to have come from this site. If so, they say, "the valley must still have been populated as late as the eleventh or twelfth century (we follow Thompson's Scheme B dating of effigy plumbate. . . .)" This leaves at least 350 to 450 years to account for between a plumbate horizon and the Spanish conquest. Dr. Kidder's recent study of White-on-Red pottery and related wares from protohistoric sites excavated by Lothrop and A. L. Smith will undoubtedly fill part of this time gap, but I wonder whether the hilltop fortresses can account for so long a period, particularly in view of evidence provided by the native chronicles, which place the founders of Utatlan and Iximche only a few generations before 1493.

Since neither plumbate pottery nor White-on-Red pottery was actually found at Kaminaljuyu, the report does not delve very deeply into protohistoric matters. I shall look forward to Dr. Kidder's later reports on Amatle-Pamplona and the White-on-Red pottery horizon, for they will perhaps explain more fully how a proponent of the Goodman-Thompson-Martinez Correlation applies the 11.16.0.0.0 formula to the period between 10.18.0.0.0 and 1524 without ignoring completely our only real guide to prehistoric dating of Guatemala highland sites: the native chronicles.

I agree wholeheartedly with the authors and Dr. Kroeber that we should not attempt to correlate legendary chronicles with an incomplete archaeological record, if I may amend the idea by adding "unless we remind ourselves that such correlations are speculative." The authors' suggestion that the Pipils may have evicted the Amatle-Pamplonans is speculation of this type, but thereby loses none of its stimulative value as one more tentative conceptual scheme to

bear in mind during future investigations. They call attention to the unfortunate error that identified Teotihuacan as either Tolian or another Toltec metropolis, when actually Teotihuacan proved to be pre-Mazapan. I do feel, on the other hand, that the authors are a little harsh with the chronicles, when they say that these should not be trusted because "even in their original form they were probably to a large extent based on dim and imprecise memories; that fact was mingled with miracle; and that they deal overmuch, for our purposes, with wars, conquests, and the doings of royal families." Native chronicles have provided the chief clues to several suggested correlations, including that of Goodman-Thompson-Martinez; and when two native chronicles, one in the Quiche language and another in the Cakchiquel, agree as closely as do the *Popol Vuh* and the *Annals of the Cakchiquels* in the number of generations counted to certain prehistoric events, I am inclined to give them as much credence as I would, say, to a child whose father has taught him to memorize the names of the U. S. presidents back to Theodore Roosevelt. It is quite true that we encounter miracles in the earlier passages, but that the annals deal with wars, conquests, and doings of royal families may be fortunate rather than deplorable.

In the meantime, let us share the authors' hope that another chance discovery like that reported by Linne will some day enable us to link Mesoamerican chronology with the tree-ring sequence of the southwestern United States. We shall then be on much firmer ground than that provided by native chronicles, ancient and imprecise astronomical observations, and abbreviated hieroglyphic dates.

The closing paragraphs in this section combine (1) a statement of certain fundamental anthropological problems which Archaeology can help to solve, with (2) a strong reply to critics who are impatient with archaeologists' apparent absorption with chronology and typology. The problems mentioned are stimulating; they are only a few of the many Dr. Kidder has stated in the Carnegie Yearbooks, which, I regret to say, are overlooked by too many students of anthropology. Volumes could be written (and in several cases have been written) on the authors' questions regarding factors which condition the growth rate of civilizations. American prehistory can provide many of the answers, but not until we know much more about American chronology.

The authors' closing pleasantry, that they were really motivated by "an incurable liking to dig," is irrelevant to their foregoing remarks; whatever their personal motives, it is their broad grasp of the eventual significance of the details which Dr. Kidder, Dr. Jennings, and Mr. Shook sought, found, analyzed, and interpreted, that makes this volume the great contribution that it is.

I have neglected the more detailed descriptive chapters and format of the book, for comment would require more space than is at my disposal. The excavations were painstaking and brilliantly executed; the comparative research was exhaustive. The drawings and Miss Proskouriakoff's architectural restorations are excellent; the slightest clues, such as beam moulds in the grave fill, were detected and utilized.

The volume itself is a typically handsome Carnegie publication. The collotype reproductions are of the finest quality, much superior to half-tones. The expense of four pages of color seems wholly warranted. The detailed descriptions, supporting evidence, long and minute comparative data, and most of the "dirt archaeology" might well have been printed in smaller type face. I personally find "footnote" references disconcerting when left in the body of the text, especially when they interrupt a sentence several times, but there are arguments both for and against this practice.

In spite of the picayunish bits of adverse criticism which I have mustered to make this review respectable, I find it difficult not to summarize my respect for this book with too lavish use of superlatives. It combines just about everything that an archaeological report should have: complete documentation and penetrating interpretation, guided by an awareness of what we are really trying to learn.

ROBERT WAUCHOPE
Middle American Research Institute
Tulane University of Louisiana
New Orleans, Louisiana

NOTES AND NEWS

SPECIAL MEETING AT ALBUQUERQUE

During the recent 46th Annual Meeting of the American Anthropological Association, held at the University of New Mexico, Albuquerque, December 28–31, 1947, the Society for American Archaeology was privileged to present two special sessions and to act as a co-sponsor for two symposia. The original plans called for one special session, but a long list of papers inspired the program committee to request additional time, which the executive officials of the American Anthropological Association freely granted.

A total of 17 papers covering a wide range of subjects were read during these two programs, attended by an aggregate of 250 people.

The first of the two symposia was on Early Man in America, Loren C. Eiseley, Chairman, followed on December 30 by a symposium on Mexican Anthropology and Problems of the Greater Southwest, Ralph E. Beals, Chairman. This session was presented in the St. Francis Auditorium, New Mexico State Museum, Santa Fe. (*Emil W. Haury.*)

PAPERS AT THE ALBUQUERQUE MEETING

The following papers were delivered on Sunday morning, December 28 at a "Symposium on Early Man in America," of which Loren C. Eiseley was chairman. The Society for American Archaeology co-sponsored this symposium.

F. R. Eggan, A Progress Report on the Dating of Archaeological Sites by Means of Radioactive Elements
T. Dale Stewart, Comparisons Between Tepexpan Man and Other Early Americans
Emil W. Haury, The Stratigraphy of Ventana Cave
C. Bertrand Schultz and W. D. Frankforter, The Lime Creek Sites: New Evidence of Early Man in Southwestern Nebraska
Joseph B. Birdsell, A Redefinition of the So-Called "Australoid" Problem in the Americas

The special session of the Society for American Archaeology was held on Monday, December 30 under the chairmanship of Emil W. Haury. The following papers were delivered during the morning:

L. S. Cressman, Klamath Archaeology; Preliminary Report
Arden R. King, Preliminary Report on the Cattle Point Site, San Juan Island, Washington
Jesse D. Jennings, The Physical and Scientific Accomplishments of the River Valley Surveys Program in Region Two of the National Park Service
Wesley L. Bliss, Archaeological Problems in the Western Plains
John L. Cotter, Certain Hopewellian Traits so far identified at the Bynum Site, Northeastern Mississippi
John W. Griffin, Developments in the Historic Archaeology of Florida
William C. Massey, Archaeology and History in the Cape Region of Lower California
Harold S. Colton, The Nature of Frontiers between two Prehistoric Tribes of the Southwest

The session continued during the afternoon with the following papers:

Gordon C. Baldwin, Recent Investigations of the Patayan Culture in the Colorado River Valley
Paul S. Martin, Results of the 1947 Expedition of Chicago Natural History Museum to Western New Mexico
Odd S. Halseth, A Hohokam Mound
T. N. Campbell, The Present Status of Texas Coast Archaeology
Donald J. Lehmer, Southwestern Culture Origins
Malcolm F. Farmer, Archaeological Work in the La Jolla Area of San Diego County, California
Gordon W. Hewes, The Northern Great Plains and Current Archaeological Ideologies
Georg Neumann, Data and Speculations on the Peopling of America
Elias Adis-Castro, Data on Inbreeding among the Hopewell People of Illinois

On Tuesday afternoon, December 30 there was a "Symposium on Mexican Anthropology and Problems of the Greater Southwest" with Ralph L. Beals as chairman. The Society for American Archaeology was again co-sponsor, and the following archaeological papers were delivered:

Helmut de Terra, The Fossil Man of Tepexpan, his Environment and Geologic Age
Ignacio Bernal, The End of Monte Alban
Edward W. Gifford, Archaeology of the Ixtlan Region, Nayarit
Paul Reiter, Archaeological Reconnaissance in Southeastern Chihuahua

THE FIFTH PLAINS CONFERENCE FOR ARCHAEOLOGY

The Fifth Plains Conference for Archaeology was held at the Laboratory of Anthropology, University of Nebraska, on November 28 and 29, 1947. The registration list of 84 names indicates an active interest in Plains archaeology, and especially in the archaeological program of the Missouri River Project of the River Basins Surveys.

The *Proceedings of the Fifth Plains Conference* will be published in full as soon as the papers and reports can be assembled. Arrangements are complete to bring out these *Proceedings* as the first number of a new series to be inaugurated by the Laboratory of Anthropology, University of Nebraska. Dr. John L. Champe, of that organization, Secretary for the Fifth Plains Conference, will act as Editor, with the four Chairmen of the Conference symposia as Associate Editors.

The first symposium, presented on Friday morning, November 28, was in charge of Dr. Waldo R. Wedel, U. S. National Museum, as Chairman. Summary reports of field work were given by seventeen archaeologists, representing the major institutions operating in the Plains area, as well as the several projects of the River Basins Surveys. A commentary of these reports, including his own observations as Field Director of the Missouri River Project, was given by Dr. Wedel at the Friday luncheon meeting.

The subject for the Friday afternoon meeting was Pottery Types and Typing, with Dr. Jesse D. Jennings as Chairman. Fourteen members participated in the symposium. Pottery types already described in the literature were reviewed, and several new types were presented for discussion. The Chairman has summarized the findings of this symposium as follows:

1. Pottery type descriptions should follow the form developed by the Southeastern Conference.
2. A standardized nomenclature, adapted to Plains data, should be devised and circulated by News Letter.
3. One or more model type descriptions should be circulated by News Letter.

4. Extreme caution should be used in the release of pottery types.
5. At least one day should be devoted to ceramics in the next Plains Conference.

W. C. McKern, Milwaukee Public Museum, acted as Chairman of a General Session, Saturday morning, November 29, 1947. Six papers on Plains archaeology were offered; recent developments in Central Plains dendrochronology were discussed; and a short description of the Yale-Nebraska Cross-Cultural Survey of the Central Plains was presented. A discussion of archaeological theory by Dr. James B. Griffin, University of Michigan, highlighted the luncheon meeting which followed.

Dr. Frank H. H. Roberts, Jr., Bureau of American Ethnology, presided at the Saturday afternoon session. The program provided a round-up of geological, paleontological, and archaeological evidence for early human occupancy of the Central Plains, emphasizing the important role of climatic terraces in estimating the age of archaeological material. A review of the important new Plainview, Texas, finds, and a preliminary report of the Lime Creek, Nebraska sites were features of the symposium.

Dr. Jesse D. Jennings, National Park Service, Omaha, Nebraska, was selected as Conference Secretary for the Sixth Plains Conference, which will be held in Lincoln, Nebraska, November 25, 26, and 27, 1948. Publication of a News Letter, with Dr. Jennings as Editor, has begun, with special attention to the preliminary presentation of pottery types. (*John L. Champe*, University of Nebraska, Lincoln, Nebraska.)

SOUTHWESTERN ARCHAEOLOGICAL CONFERENCE

By agreement of those attending the Sixth Annual Chaco Canyon Anthropological Conference during the summer of 1947, the 1948 session will be held at the University of Arizona Archaeological Field School at Point of Pines on the San Carlos Indian Reservation, Arizona.

It was suggested that the conference be held after the Gallup Ceremonial, which has been announced for August 19–22, 1948. The Southwestern Archaeological Conference dates, therefore, will be August 24-26, 1948. A cordial invitation is extended to anthropologists to attend the meeting. While the discussions will center about Southwestern archaeological problems, efforts will be made to keep the scope broad enough to hold the interest of those not primarily engaged in this field.

Through the courtesy of the Viking Fund, Inc., New York, the University will furnish board and such lodging in tents (capacity about 65) as will be available. Participants are requested to bring small tents if possible and their own bedrolls.

Inquiries and suggestions for the agenda will be welcomed. (*Emil W. Haury*, University of Arizona, Tucson, Arizona.)

THE WISCONSIN ARCHAEOLOGICAL SURVEY

In recent years, science has advanced rapidly through a cooperative approach. The atomic energy program as it is established today could not possibly be carried to completion if the resources, both in personnel and materiel, were not pooled. There is no need at this point to consider the relative scope of problems in atomic energy and archaeology since it is obvious that archaeology can benefit too from such an approach. When we make an estimate of the amount of work needed and compare it with the resources available, the need for a cooperative approach in archaeology is indeed imperative. The Wisconsin Archaeological Survey was formed as a step in this direction.

At present Wisconsin has many more professional anthropologists working within its borders than ever before. Recently, those interested in archaeology met to form this new organization whose purpose is the coordination of the archaeological activities of the various institutions represented. The composition of the executive committee and the institutions represented are as follows:

David A. Baerreis	University of Wisconsin (Chairman)
W. W. Howells	University of Wisconsin
W. C. McKern	Milwaukee Public Museum
Moreau Maxwell	Beloit College
Robert Ritzenthaler	Milwaukee Public Museum
Chandler Rowe	Lawrence College
Andrew C. Whiteford	Beloit College

It was felt that there was a need for coordination first of all in survey activities. In this, as in other fields of research, it is relatively easy to have duplication of effort if no centralized supervising body is in existence. The Wisconsin Archaeological Society is continuing its survey activities and has undertaken the responsibility of compiling all known information regarding Wisconsin sites and giving the sites a uniform designation. The latter activity is considered particularly important since Wisconsin has been handicapped by the fact that many sites have been referred to under different names. As the major gaps in the survey of the state are revealed, these will be filled by further work. The primary importance of this phase of the archaeological work led to the selection of the name for the new organization.

For the most part, the institutions of the state are operating under rather limited resources for excavation purposes. Through cooperation in field activities under the new Survey, it is hoped that the pooled resources will permit excavations on a larger scale than were possible in the past. This aspect of the Survey is not designed to curtail individual interests, but rather to provide a means for cooperation when large and important problems, whose scope is beyond the resources of a single institution, arise. As part of the program, Beloit College will have a party in the field this summer, with assistance being given by the Survey. Cooperation in this field is by no means limited to the institutions listed under the composition of the executive committee. During this season, the State Historical Society of Wisconsin is contributing financially to the excavation program of the Survey.

The University of Wisconsin has also been designated as a repository for field notes and unpublished manuscripts on Wisconsin archaeology. It is hoped that a centralized repository will facilitate the consultation and use of unpublished materials.

The Wisconsin Archaeological Survey has at present a rather informal organization, yet concrete achievements may be expected soon. Research on Wisconsin's prehistory should be expedited and a greater continuity in the research maintained. Since the proposed activities might be profitably applied in other regions, it was felt that a preliminary report on the group would be of some value. (*David A. Baerreis.*)

SOUTHWEST

During the summer of 1947 the Chicago Natural History Museum continued work in west-central New Mexico. Dr. Rinaldo conducted an intensive archaeological survey in the area, covering more than 100 square miles and discovering upwards of 100 sites. With the help of Mr. E. B. Sayles of the Arizona State Museum, a pre-pottery site was discovered which upon investigation may be classified as belonging to the Chiricahua horizon of the Cochise culture.

Excavations were carried on in four sites which yielded evidence from the following phases: Pine Lawn, Three Circle, and Reserve. The report on these investigations is in press and will be issued during 1948 by the Museum press. (*Paul S. Martin.*)

SUMMER TRAINING PROGRAMS

Paul Reiter has called the Associate Editor's attention to a condition which he had already observed with some interest, namely, the development of summer training programs for archaeology field schools. Some of these combine broader anthropological training, but the majority concentrate on archaeology. The following institutions are sponsoring such programs:

University of Arizona
Museum of Northern Arizona
University of California (Berkeley)
Adams State College, Alamosa, Colorado
University of Colorado
Indiana University
University of Kansas
University of Michigan
University of Missouri
University of New Mexico
Western State College, Gunnison, Colorado
University of North Dakota
University of Oklahoma
University of Pennsylvania
University of Washington

Further information concerning these programs will be presented in the July issue of AMERICAN ANTIQUITY, in connection with plans for summer field work.

SOME RECENT PUBLICATIONS

The following abbreviations appear in the list which follows:

AA	American Anthropologist, New Series. Menasha, Wisconsin.
AcAm	Acta Americana. Los Angeles.
AI	América Indígena. México.
AJPA	American Journal of Physical Anthropology, New Series. Philadelphia.
ASC-B	Archaeological Society of Connecticut, Bulletin. New Haven.
ASC-NL	Archaeological Society of Connecticut, News-Letter. New Haven.
ASD-B	Archaeological Society of Delaware, Bulletin. Wilmington.
ASNJ-NL	Archaeological Society of New Jersey, News Letter. Trenton.
ASNJ-RS	Archaeological Society of New Jersey, Research Series. Trenton.
AV	Acta Venezolana. Caracas.
BA	Boletín de Arqueología. Bogotá.
BBAA	Boletín Bibliográfico de Antropología Americana. México.
BERH-B	Bureau d'Ethnologie de la République d'Haiti, Bulletin, Series II. Port-au-Prince.
CA	Cuadernos Americanos. México.
CGG	Contribuciones del Grupo Guamá. Habana.
CIW-NMAAE	Carnegie Institution of Washington, Division of Historical Research, Notes on Middle American Archaeology and Ethnology. Washington.
CIW-P	Carnegie Institution of Washington, Publications. Washington.
CNHM-B	Chicago Natural History Museum, Bulletin. Chicago.
EMA	El México Antiguo. México.
EP	El Palacio. Santa Fe.
Et	Etnología. Bogotá.
FMNH-AS	Field Museum of Natural History, Anthropological Series, Chicago.
HM	Honduras Maya. Tegucigalpa.
IE-TM	Institut d'Ethnologie, Travaux et Mémoires. Paris.
IEA-A	Instituto de Etnología Americana, Universidad Nacional de Cuyo, Anales. Cuyo, Argentina.
ISAS-J	Illinois State Archaeological Society, Journal. Champlain.
K	The Kiva. Tucson.
M	Man. London.
MARR	Middle American Research Records. New Orleans: Tulane University.
Mas	The Masterkey. Los Angeles: Southwest Museum.
MASAL-P	Michigan Academy of Science, Arts and Letters, Papers. Ann Arbor.
MAS-B	Massachusetts Archaeological Society, Bulletin. Andover.
MAS-NL	Massachusetts Archaeological Society, News Letters. Andover.
MBG-A	Missouri Botanical Garden, Annals. St. Louis.
ME	Museum Echoes. Columbus: Ohio State Museum.
MLP-R	Museo de la Plata, Revista, New Series. La Plata.
MP	Medallion Papers. Globe: Gila Pueblo.
MS	Museum Service, Rochester: Museum of Arts and Sciences.
NGM	National Geographic Magazine, Washington.
NYAS-T	New York Academy of Science, Transactions, Series 2. New York.
NYSAA-RT	New York State Archaeological Association, Researches and Transactions. Rochester.
OSAHQ	The Ohio State Archaeological and Historical Quarterly. Columbus.
PA	Pennsylvania Archaeologist. Harrisburg.
RAE	Revista de Arqueología y Etnología, Segunda Epoca. Habana.
RMEA	Revista Mexicana de Estudios Antropológicos. México.
RMNL	Revista del Museo Nacional. Lima.
RSPFA-P	Robert S. Peabody Foundation for Archaeology, Papers. Andover.
S	Science, New York.
SAP-J	Société des Américanistes de Paris, Journal, New Series. Paris.
SBMNH-ML	Santa Barbara Museum of Natural History, Museum Leaflet. Santa Barbara.
SCN-M	Sociedad de Ciencias Naturales La Salle, Memorias. Caracas, Venezuela.
SGH-A	Sociedad de Geografía e Historia, Anales. Guatemala.
SI-ISA	Smithsonian Institution, Institute of Social Anthropology. Washington.
SJA	Southwestern Journal of Anthropology. Albuquerque.
SL	Southwestern Lore. Gunnison, Colorado.
SMC	Smithsonian Miscellaneous Collections. Washington.
T	Tsumpane. San Salvador.
TA	Tennessee Archaeologist. Knoxville.
Tl	Tlalocan. México.
TRB	Tree-Ring Bulletin. Tucson.
UC-PAAE	University of California Publications in American Archaeology and Ethnology. Berkeley and Los Angeles.
UKRA	University of Kentucky Reports in Anthropology. Lexington.
VFPA	Viking Fund Publications in Anthropology. New York.
YUPA	Yale University Publications in Anthropology. New Haven.

GENERAL

Anderson, Edgar. *Corn before Columbus*. 24 pp. Des Moines, 1947.

Anonymous. "Ancient American Art." *Worcester Art Museum, News Bulletin and Calendar*. Vol. 13, No. 1, pp. 1–2. Worcester, Mass., 1947.

Anonymous. *Catalogue de l'exposition: chefs-d'oeuvre de l'Amérique précolombienne* [XXVIIIe Congrès International des Américanistes]. Paris, 1947.

Anonymous. "Diggers." *Time Magazine*, Vol. 49, No. 4, pp. 74–6. New York, 1947.

Anonymous. "Master Works of Cryptic Cultures: Ancient American Art now on Exhibition." *London Illustrated News*, Vol. 2100, No. 5644, p. 664. London, 1947.

Anonymous. "Primera conferencia internacional de arqueológicos del Caribe." T, Año. 6, No. 5, pp. 28–41. 1946.

Anonymous. "Sensacional evento científico en Honduras: el congreso arqueológico de los paises del Caribe." T, Año 6, No. 5, pp. 42–3. 1946.

Anonymous. "Sylvanus Morley appointed Acting Director of the School of American Research." EP, Vol. 54, No. 6, p. 131. Santa Fe, 1946.

Barnes, Alfred S. "The Production of Long Blades in Neolithic Times." AA, Vol. 49, No. 4, pp. 625–30. 1947.

Basauri Retolaza, Daniel. "El pueblo vasco factor importante en el poblamiente precolombino de America?" SGH-A, Vol. 21, No. 2, pp. 144–8. 2 figs. 1946.

Bendure, Zelma, and G. Pfeiffer. *America's Fabrics; Origin and History, Characteristics and Uses*. New York, 1946.

Bliss, Robert Woods. *Indigenous Art of the Americas*. Washington, 1947.

Clark, Grahame. *Archaeology and Society*. Second Edition, Revised. 222 pp., 24 pls., 29 drawings. London: Methuen and Co., Ltd., 1947.

Comas, Juan. *Origen y evolución del hombre*. 94 pp., 4 figs. México, 1947.

Conklin, Edwin G. "A Brief History of the American Philosophical Society." *American Philosophical Society, Year Book* for 1946. Philadelphia, 1947.

Cookson, M. B. "Archaeological Photography." *Ancient India*, No. 2, pp. 134–37. Delhi, 1946.

Erwin, A. T. "Sweet Corn not an Important Indian Food Plant in the Pre-Colombian Period." *Journal of the American Society of Agronomy*, Vol. 39, No. 2, pp. 117–21. 1947.

Ferdon, Edwin N. "Why Archeology?" EP, Vol. 54, No. 1, pp. 16–18. 1947.

Garrod, D. A. E. *Environment, Tools and Man*. 30 pp. Cambridge: Cambridge University Press, 1946.

Gladwin, Harold S. *Men Out of Asia.* 390 pp., 5 pls., 138 figs., 8 maps. New York, 1947.

Hooton, E. A. *Up from the Ape.* Revised Edition. xxi+788 pp. New York, 1946.

Jiménez, Tomás Fedias. "Cultura americana precolumbiana." T, Año 5, No. 6, pp. 114-25. 1946.

Krogman, W. M. "The Reconstruction of the Living Head from the Skull." *F.B.I. Law Enforcement Bulletin*, Vol. 15, No. 7, pp. 11–18. Washington, 1946.

Lips, Julius E. *The Origin of Things.* Illustrated by Eva Lips, with contributions by A. Kameny and A. A. Wyn. 496 pp. New York, 1946.

Lowe, C. van Riet. "Preservation of Prehistoric Rock Paintings and Petroglyphs." *South African Museum of Anthropology, Bulletin*, Vol. 3, No. 15, pp. 1–9. Pretoria, South Africa, 1946.

Lussagnet, S. "Bibliographie américaniste." SAP-J, Vol. 35, pp. 185–322. 1947.

McIlwraith, T. F. "Annual list of Publications on Ethnology, Anthropology, and Archaeology." *Canadian Historical Review* for March, 1947, pp. 104–16. Toronto, 1947.

Miller, Mamie Tanquist. "An Author, Title, and Subject Check list of Smithsonian Institution Publications relating to Anthropology." *University of New Mexico Bulletin, Bibliographical Series*, Vol. 1, No. 2, Whole No. 405. Albuquerque, 1946.

Morales Patiño, Oswaldo. "Fallecimiento de George C. Vaillant." RAE, Vol. 1, No. 3, p. 79. 1946.

Muelle, Jorge C. "Notas necrológicas: Professor Max Uhle." RMNL, Vol. 14, pp. 192–3. 1945.

Muelle, Jorge C. "Notes necrológicas: Philip Ainsworth Means." RMNL, Vol. 14, pp. 193–94. 1945.

Patai, Raphael. "The Science of Man: an Introduction to Anthropology." *Studies in Folklore and Ethnology*, Vol. 3. 255 pp., 37 figs. Tel Aviv. 1947.

Rainey, Froelich G., editor. "Masks." *University Museum Bulletin*, Vol. 13, No. 1. 25 figs. Philadelphia, 1947.

Ries, Maurice, editor. *Keeping up with Man*, and supplement, *Keeping Up with Archaeologists.* 6 pp. Santa Fe: Laboratory of Anthropology, 1946.

Ritchie, William A. "Theory and Practice in Museum Exhibition." MS, Vol. 20, No. 5, pp. 54–5. 1947.

Rivet, Paul, and H. Arsandaux. "La métallurgie en Amérique précolombienne." IE-TM, vol. 39. 1946.

Sauer, Carl O. "Early Relations of Man to Plants." *Geographical Review*, Vol. 37, No. 1, pp. 1–25. New York, 1947.

Steward, Julian H. "American Culture History in the Light of South America." NYAS-T, Vol. 9, No. 6, pp. 231–2. 1947.

Steward, Julian H. "American Culture History in the Light of South America." SJA, Vol. 3, No. 2, pp. 85–107. 1947.

ARCTIC

Ekblaw, W. Elmer. "Distribution of the Settlement among the Polar Eskimo." MAS-B, Vol. 8, No. 3, pp. 39–43. 1947.

Giddings, J. L., Jr. "Mackenzie River Delta Chronology." TRB, Vol. 13, No. 4, pp. 26–9. 1 fig. 1947.

Hewes, Gordon W. "Archaeology of Korea: a Selected Bibliography." *Research Monograph on Korea*, Series F, No. 1. 18 pp., 1 map. Hamilton, N. Y., 1947.

Kraus, Bertram S. "Current Problems in Japanese Prehistory." SJA, Vol. 3, No. 1, pp. 57–68. 1947.

Laguna, Frederica de. "The Prehistory of Northern North America as seen from the Yukon." MEMOIRS OF THE SOCIETY FOR AMERICAN ARCHAEOLOGY, No. 3. 360 pp., 30 pls., 32 figs., 1 map. Menasha, 1947.

Leroi-Gourhan, André. "Archéologie du Pacifique-Nord: matériaux pour l'étude des relations entre les peuples riverains d'Asie et d'Amérique." IE-TM, Vol. 47. 1946.

PACIFIC COAST

Anonymous. "More Steatite Objects." Mas, Vol. 21, No. 3, pp. 104–5. 1947.

Cook, S. F., and R. F. Heizer. "The Quantitative Investigation of Aboriginal Sites: Analysis of Human Bone." AJPA, Vol. 5, No. 2, pp. 201–20. 1947.

Gifford, E. W. "California Shell Artifacts." *Anthropological Records*, Vol. 9, No. 1. Berkeley and Los Angeles, 1947.

Harrington, M. R. "A Rare Bone Club." Mas, Vol. 21, No. 5, p. 154. 1947.

Heizer, Robert F. "Francis Drake and the California Indians, 1579." UC-PAAE, Vol. 42, No. 3. 1947.

Heizer, Robert F. "Historical North Pacific Cultural Influences in the Santa Barbara Region." Mas, Vol. 21, No. 5, pp. 150–2. 1947.

Irwin, Margaret C. "The Anthropology Department." SBMNH-ML, Vol. 20, No. 3, pp. 29–34. 1945.

Irwin, Margaret C. "Rare Seed-gathering Implements of California: Are There any More like This?" SBMNH-ML, Vol. 21, Nos. 8 and 9, pp. 66–7. 1946.

Orr, Phil C. "Return to San Nicolas." SBMNH-ML, Vol. 20, No. 7, pp. 75–9. 1945.

Schulman, Edmund. "Dendrochronologies in Southwestern Canada." TRB, Vol. 13, Nos. 2–3. 1946–47.

Simpson, Ruth D. "A Classic 'Folsom' from Lake Mohave." Mas, Vol. 21, No. 1, pp. 24–5. 1947.

Smith, Marian W. "Petroglyph Complexes in the History of the Columbia-Fraser Region." SJA, Vol. 2, No. 3, pp. 306–22. 1946.

Walker, Edwin F. *Excavation of a Yokuts Indian Cemetery.* 57 pp., 30 pls., 4 maps, 2 tables. Bakersfield, California: Kern County Historical Society, 1947.

SOUTHWEST

Anderson, Arthur J. O. "Bandelier's First Visit to Santa Fe." EP, Vol. 54, No. 6, pp. 138–9. Santa Fe, 1947.

Anonymous. "Expedition to the Southwest hunts Early Site." CNHM-B, Vol. 18, No. 6, p. 3. 1947.

Anonymous. "Summer Field Work in the Southwest." EP, Vol. 54, No. 6, pp. 138–9. 1947.

Baldwin, Gordon C. "An Archaeological Reconnaissance of the Yampa and Green Rivers. K, Vol. 12, No. 3, pp. 31–6. 1947.

Brues, Alice M. "The San Simon Branch: Excavations at Cave Creek and in the San Simon Valley. II, Skeletal Material." MP, No. 35. ix+26 pp., 2 pls., 1 fig., 6 tables. 1946.

Cosgrove, C. B. "Caves of the Upper Gila and Hueco Areas in New Mexico and Texas." PM-P, Vol. 24, No. 2. 181 pp., 2 tables, 149 figs. 1947.

Douglass, A. E. "Precision of Ring Dating in Tree-Ring Chronologies." *University of Arizona Bulletin*, Vol. 17, No. 3. Tucson, 1946.

Farmer, Malcolm F. "Upper Largo Navaho—1700–1775." K, Vol. 12, No. 2, pp. 15–24. 1947.

Ferdon, Edwin N., Jr. "An Excavation of Hermit's Cave, New Mexico." *Monographs, School of American Research*, No. 10, pp. 1–29. Santa Fe, 1946.

Gibson, Gordon D. "On Gladwin's Methods of Correlation in Tree-Ring Analysis." AA, Vol. 49, No. 2, pp. 337–40. 1947.

Gladwin, Harold S. "Tree-Ring Analysis: Tree-Rings and Droughts." MP, No. 37. vi+36 pp., 1 pl., 2 figs., 6 tables. 1947.

Halseth, Odd S. "Random Notes on the 1947 Chaco Conference." EP, Vol. 54, No. 9, pp. 218–20. 1947.

Harshbarger, Ira. "The Story of the Loveland Stone Age Fair." SL, Vol. 13, No. 1, pp. 7–8. 1947.

Hawley, Fred G. "The Use of Lead Mineral by the Hohokam in Cremation Ceremonials." SJA, Vol. 3, No. 1, pp. 69–77. 1947.

Hendron, J. W. *Frijoles: a Hidden Valley in the New World.* Dorothy Thomas, editor. 91 pp. Santa Fe, 1946.

Hill, Gertrude. "Turquoise and the Zuni Indian." K, Vol. 12, No. 4, pp. 42–51. Tucson, Arizona, 1947.

Howe, Sherman S. "My Story of the Aztec Ruins." EP, Vol. 54, No. 10, pp. 247–8. 1947.

Hurst, C. T. "Excavation of Dolores Cave—1946." SL, Vol. 13, No. 1, pp. 8–17. 1947.

Hurst, C. T. "The Prehistory of Western Colorado." SL, Vol. 8, No. 2. 23 pp. 1947.

Hurst, C. T. "The Gunnison Collection, XII." SL, Vol. 8, No. 3. 1947.

Kemble, Horace. "Indian Trees." SL, Vol. 12, No. 4, pp. 78–9. 1947.

Johnson, Leonhard G. "Some Ancient 'DP's' of New Mexico." CNHM-B, Vol. 18, No. 9, pp. 1, 8. 1 fig. 1947.

Lister, Robert H. "Survey of Archaeological Remains in Northwestern Chihuahua." SJA, Vol. 2, No. 4, pp. 433–53. 1946.

Martin, Paul S., and John B. Rinaldo. "The SU Site: Excavations at a Mogollon Village, Western New Mexico, Third Season, 1946." FMNH-AS, Vol. 32, No. 3. 1947.

Mason, Edith Hart. "The Cave of the Flutists." Mas, Vol. 22, No. 1, pp. 6–9. 1948.

Morris, Earl H. "Experiences in Southwestern Archaeology." SL, Vol. 8, No. 2. 22 pp. 1947.

Reed, Erik K. "Flood Damage to Chetro Ketl." EP, Vol. 54, No. 10, pp. 238–40. 1947.

Reed, Erik K. "The 1947 Chaco Conference." EP, Vol. 54, No. 9, pp. 217–18. 1947.

Reed, Erik K. "Reunion arqueológica del Suroeste de los Estados Unidos." BBAA, Vol. 9, p. 25. 1947.

Rinaldo, John. "How Prehistoric Pueblo Indians of the Southwest Lived." CNHM-B, Vol. 18, No. 8, pp. 1–2. 2 figs. 1947.

Sayles, E. P. "The San Simon Branch: Excavations at Cave Creek and in the San Simon Valley: 1, Material Culture." MP, No. 34. 78 pp., 60 pls., 33 figs., 1 map. 1945.

Schroeder, Albert H. "Montezuma Well." *Plateau*, Vol. 20, No. 3, pp. 37–40. Flagstaff, 1948.

Smiley, Terah L. "Dates from a Surface Pueblo at Mesa Verde." TRB, Vol. 13, No. 4, pp. 30–2. 1 fig. 1947.

Stewart, Omer C. "Archaeological Mapping in Colorado." SL, Vol. 8, No. 2. 23 pp. 1947.

Stewart, Omer C. "Archaeology, Ethnology and History in Colorado." SL, Vol. 8, No. 2, pp. 24–7. 1947.

Stewart, Omer C. "Field Manual for an Archaeological Survey." Supplement to SL, Vol. 13, No. 1. 11 pp., 4 pls. 1947.

Stewart, Omer C. "Objectives and Methods for an Archaeological Survey." SL, Vol. 12, No. 4, pp. 62–75. 1947.

Tatum, Robert M. "Excavation of a Stone Enclosure in Southeastern Colorado." SL, Vol. 8, No. 2, pp. 33–6. 1947.

Tichy, Marjorie F. "A Ceremonial Deposit from the Pajarito Plateau." EP, Vol. 54, No. 10, pp. 227–37. 1947.

Tichy, Marjorie F. "A Painted Ceremonial Room at Otowi." EP, Vol. 54, No. 3, pp. 59–69. 1947.

Walter, Paul A. F. "Edgar Lee Hewett, Americanist, 1865–1946." AA, Vol. 49, No. 2, pp. 260–71. 1947.

Watson, Don. "Note on the Dating of Pipe Shrine House." TRB, Vol. 13, No. 4, p. 32. 1947.

Woodward, Arthur. "Ancient Artists of the Southwest." *Quarterly of the Los Angeles County Museum*, Vol. 6, No. 1 pp. 3–6. 3 figs. 1947.

Wormington, H. M. "Prehistoric Indians of the Southwest." *Colorado Museum of Natural History, Popular Series*, No. 7, Denver, 1947.

PLAINS

Anonymous. "Primer 'Symposium' sobre el Area Caddo (12–14 de Septiembre, 1946)." BBAA, Vol. 9, pp. 19–22. 1947.

Jennings, Jesse. "Report of the Fifth Plains Archaeological Conference." *Plains Archaeological Conference News Letter* for Dec. 10, 1947. Omaha.

Orchard, W. J. "Stone Implements from Alberta." M, Vol. 47, Art. 123, pp. 115–16. 1947.

Renaud, Etienne B. *Archaeology of the High Western Plains: Seventeen Years of Archaeological Research*. Denver, 1947.

Wedel, Waldo R. "Note on Some Potsherds from Northeastern Wyoming." *Journal of the Washington Academy of Sciences*, Vol. 37, No. 5, pp. 157–9. Washington, 1947.

Wedel, Waldo R. "Prehistory and Environment in the Central Great Plains." *Transactions of the Kansas Academy of Science*, Vol. 50, No. 1. Kansas City, 1947.

NORTHERN MISSISSIPPI VALLEY

Anonymous. "Braecklin prepares to write Volume of his Archaeological Reminiscences." ISAS-J, Vol. 4, No. 3, pp. 27–30. 1 fig. 1947.

Anonymous. "Ed Meiners, Wood River, Illinois, assembles a Large Collection of Unusual Artifacts." ISAS-J, Vol. 4, No. 3, pp. 17–18. 1947.

Anonymous. "Wakeman collects Interesting Artifacts in Home Area." ISAS-J, Vol. 5, No. 1, pp. 24–5. 9 figs. 1947.

Burford, C. C. "The Geography of Illinois as a Basis for its Indian Life and Later White Settlement." ISAS-J, Vol. 4, No. 4, pp. 26–31. 1947.

Burford, C. C. "Indian Exhibit, University of Illinois, a Cross-Section of Civilization and Artifacts." ISAS-J, Vol. 5, No. 1, pp. 18–19. 1947.

Carter, George F. "The Distribution of Races of Maize among the Indians of the Mississippi Valley." NYAS-T, Vol. 9, No. 7, pp. 268–9. 1947.

Chapman, Carl H. "A Preliminary Survey of Missouri Archaeology. Part II, Middle Mississippi and Hopewellian Cultures." *Missouri Archaeologist*, Vol. 10, Pt. 2, pp. 57–94. 9 figs., 1 map. Columbia, Mo., 1947.

Deuel, Thorne, and Virginia Eifert. "The Havana Mounds." ISAS-J, Vol. 4, No. 4, p. 7. 1947.

Deuel, Thorne, and John C. McGregor. "Museum exhibits Hopewellian Artifacts." ISAS-J, Vol. 4, No. 4, p. 8. 1947.

Griffin, James B. "The Spruce Run Earthworks: a Forgotten Adena Site in Delaware County, Ohio." OSAHQ for April, 1947, pp. 188–200.

Hesselberth, Charles. "The Fall of a Culture [Hopewellian]." ISAS-J, Vol. 5, No. 1, pp. 10–13. 1947.

Martin, Paul S. "Indian Mounds: Some Facts about Them and Some Fallacies Debunked." CHNM-B, Vol. 18, No. 5, pp. 1–2. 1947.

Morgan, Richard G. "A Decorated Tobacco Pipe from the Madisonville Village Site." ME, Vol. 20, No. 5, p. 40. 1947.

Morgan, Richard G., and James H. Rodabaugh. *Bibliography of Ohio Archaeology*. Columbus, 1947.

Oehler, Charles M. *Some Notes on a Prehistoric Indian Village and Cemetery in Hamilton County, Ohio*. 5 pp. Cincinnati: Museum of Natural History, 1947.

Perino, Gregory. "Cultural Problems at Cahokia." ISAS-J, Vol. 4, No. 3, pp. 14–17. 1947.

Ruyle, John B. "From the Look-Out Rock." ISAS-J, Vol. 4, No. 4, pp. 1–3. 1947.

Thomas, Edward S. "Fort Hill." ME, Vol. 20, No. 9, pp. 67–9. 1947.

Titterington, P. F. "Four Diorite Spuds." ISAS-J, Vol. 4, No. 3, pp. 18–20. 2 figs. 1947.

Titterington, P. F. "A Tube Pipe Filter." ISAS-J, Vol. 4, No. 3, pp. 20–1. 2 illus. 1947.

Schoenbeck, Ethel. "Peoria Archaeologists continue Meetings." ISAS-J, Vol. 4, No. 4, pp. 9–10. 1947.

Waters, William L. "Personal Experiences of an Indian Relic Hunter." ISAS-J, Vol. 4, No. 4, pp. 20–2. 1947.

Williams, S. R. "The Miami Tomahawk Pipe." ME, Vol. 20, No. 7, pp. 54–5. 1 fig. 1947.

Williamson, George Hunt. "New Village Sites in Southern Illinois." ISAS-J, Vol. 4, No. 4, pp. 22–5. 1947.

NORTHEAST

Anonymous. "An Unusual Find." ASNJ-NL, No. 16, p. 5. 1947.

Blackie, W. R., Jr. "Rock Shelter in Mamaroneck, New York." ASC-NL, No. 43, pp. 3–5. 1946.

Brewer, Jesse. "A Rock Shelter at Bourne, Mass." MAS-B, Vol. 9, No. 1, pp. 15–16. 1947.

Brittingham, Joseph B., and Alvin W. *The First Trading Post at Kicotan (Kecughtan) Hampton, Virginia*. 23 pp. Newport News, Va., 1947.

Brooks, Seal T. "The Question of a Minquas Indian Fort on Iron Hill." ASD-B, Vol. 4, No. 4, pp. 27–33. 1947.

Bullen, Ripley P. "The Ernest S. Clarke Collection." MAS-B, Vol. 8, No. 3, pp. 47–8. 1947.

Bullen, Ripley P. "Notes on Prehistoric Relics from Three Beverly Graves." MAS-B, Vol. 8, No. 2, pp. 22, 24. 1947.

Bullen, Ripley P., and Edward Brooks. "The Squam Pond Indian Site, Nantucket, Massachusetts." MAS-B, Vol. 8, No. 4, pp. 56–9. 3 figs. 1947.

Bullen, Ripley P., and J. Frederick Burtt. "The Neck Creek Shell Heap, Ipswich, Massachusetts." MAS-B, Vol. 9, No. 1, pp. 4–8. 6 figs. 1947.

Butler, Eva L. "Some Early Indian Basket Makers of Southern New England." Addendum to "Eastern Algonkian Block-Stamp Decoration" by Frank G. Speck. ASNJ-RS, No. 1.

Butler, Mary. "Pottery Types in Pennsylvania." PA, Vol. 17, No. 1, pp. 117–22. 1947.

Byers, Douglas S. "Notes on the Environment of New England." MAS-B, Vol. 8, No. 2, pp. 29–31. 1947.

Carpenter, Edmund S. "A Remarkable Pipe from the Upper Allegheny." PA, Vol. 17, p. 36. 1947.

Crozier, A. "Fishing Methods of the Indians of the Delmarva Region." ASD-B, Vol. 4, No. 4, pp. 16–19. 1947.

Ekblaw, Elmer W. "New England Archaeology." ISAS-J, Vol. 4, No. 4, pp. 15–16. 1947.

Ferguson, C. C. "A West Brookfield Indian Burial." MAS-B, Vol. 9, No. 1, p. 16. 1947.

Fowler, William S. "Stone Age Methods of Woodworking in the Connecticut Valley." ASC-B, No. 20, pp. 1–32. 1946.

Gilmore, R. M. "Mammals in Archeological Collections from Southwestern Pennsylvania." *Journal of Mammalogy*, Vol. 27, No. 3, pp. 227–34. 1946.

Hadlock, Wendell S. "Eight Platform or "Mortar" pipes in the Peabody Museum, Salem, Massachusetts." MAS-B, Vol. 8, No. 4, pp. 49–52. 2 figs. 1947.

Hadlock, Wendell S. "The Significance of Certain Textiles found at Redbank, New Brunswick, in Relation to the History of the Culture Area." *Acadian Naturalist. Bulletin of the Natural History Society of New Brunswick*, Vol. 2, No. 8, pp. 49–62. St. John, 1947.

Howe, Gudurn B., and Henry F. Howe. "Pebble Beach Workshops of the South Shore [of Massachusetts Bay]." MAS-B, Vol. 8, No. 3, pp. 44–6. 1947.

Hubbell, Chapin. "Another Burial found in Niantic." ASC-NL, No. 43, p. 6. 1946.

Johnson, Frederick, and Hugh M. Raup. "Grassy Island; Archaeological and Botanical Investigations of an Indian Site in the Tonton River, Massachusetts." RSPFA-P, Vol. 1, No. 2. 68 pp., 3 pls., 9 figs., 3 tables. 1947.

Kier, Charles F., Jr. "The Jasper Quarries at Vera Cruz, Pennsylvania." ASD-B, Vol. 4, No. 4, pp. 22–6. 1947.

Leslie, Vernon. "An Archaeological Reconnaissance of Upper Delaware Valley Sites between Point Mountain and Bushkill, Pa." PA, Vol. 17, No. 1, pp. 131–41. 1947.

McIlwraith, T. F. "Digging up Ontario History." *Proceedings of the Royal Canadian Institute*, Series IIIA, Vol. 12, pp. 32–3. Toronto, 1946.

Moffett, Ross. "A Steatite Vessel and other Artifacts from a Hilltop Cache in Truro, Massachusetts." MAS-B, Vol. 8, No. 4, pp. 52–55. 1 fig. 1947.

Otis, Leo T. "Traprock: almost ready-made for the Tools of the Connecticut Valley Indians." MAS-B, Vol. 9, No. 1, pp. 1–2. 1947.

Phelps, Mason M. "The South Swansea Burials." MAS-B, Vol. 8, No. 3, pp. 33–8. 1947.

Ritchie, William A. "Archaeological Evidence for Ceremonialism in the Owasco Culture." NYSAA-RT, Vol. 11, No. 2, pp. 55–75. 4 pls. Rochester, 1947.

Ritchie, William A. "What's New in Archaeology?" MS, Vol. 20, No. 9, pp. 102–3. 1947.

Robbins, Maurice. "A Preliminary Report on the Titicut Site, Bridgewater, Mass." MAS-NL for December, 1946.

Robinson, John, "Prehistoric Relics from Beverly." Reprinted from the *Bulletin of the Essex Institute*, Vol. 27, 1895. MAS-B, Vol. 8, No. 2, pp. 22–3. 1947.

Sherman, Charles F. "Pottery Traits of the Plymouth District." MAS-B, Vol. 8, No. 2, pp. 27–9. 1947.

Sherman, Charles F. "Pottery Types of the Plymouth District." MAS-NL for December, 1946.

Smith, Benjamin L. "A Remarkable Slate Blade from Concord, Mass." MAS-B, Vol. 9, No. 1, pp. 2–4. 1 fig. 1947.

Smith, Carlyle S. "A Résumé of the Archeology of Coastal New York." ASNJ-NL, No. 16, pp. 15–18. 1 fig. 1947.

Speck, Frank G. "Eastern Algonkian Block-Stamp Decoration." ASNJ-RS, No. 1. 62 pp., 30 figs., map. 1947.

Thompson, Margaret M. *Excavating Ontario History*. Toronto: Royal Ontario Museum, 1947.

Torrey, Howard. "A Unique Grindstone from Historic Cornhill, Cape Cod, Massachusetts." MAS-NL for December, 1946.

Weslager, C. A. "The Anthropological Position of the Indian Tribes of the Delmarva Peninsula." ASD-B, Vol. 4, No. 4, pp. 3–7. 1947.

Witthoft, John. "Smoothed-base Projectile Points from Eastern Pennsylvania." PA, Vol. 17, No. 1, pp. 123–30. 1947.

SOUTHEAST

Anonymous. "The Duck River Cache." TA, Vol. 3, No. 4, pp. 54–7. 1947.

Anonymous. "Famous Duck River Flint Cache Returns to Tennessee." TA, Vol. 3, No. 3, pp. 38–41. 1947.

Anonymous. "Kiesling Cave." TA, Vol. 3, No. 2, pp. 33–4. 1947.

Anonymous. "Mastodon Bone Artifacts." TA, Vol. 3, No. 2, p. 32. 1947.

Anonymous. "Missing Two Stone Images." TA, Vol. 3, No. 4, p. 58. 1947.

Anonymous. "A Prehistoric 'Gravy-boat.'" TA, Vol. 3, No. 2, pp. 34–5. 1947.

Anonymous. "Rock Shelters." TA, Vol. 3, No. 2, pp. 32–3. 1947.

Anonymous. "Tennessee's Greatest Single Archaeological Find." TA Vol. 3, No. 2, p. 21. 1947.

Beinlich, A. W. "Broken Artifacts." TA, Vol. 3, No. 3, p. 27. 1947.

Carter, George F. "The Distribution of Races of Maize among the Indians of the Mississippi Valley." NYAS-T, Vol. 9, No. 7, pp. 268–9. 1947.

Doerschuk, H. M. "Description of Drilled Stone Indian Artifacts from a Yadkin River Site." *News-Letter of the Archaeological Society of North Carolina* for June, 1947, pp. 3–6. Chapel Hill.

Griffin, John W. "Digging up Florida's Past." *Florida Highways Magazine*, Vol. 15, No. 6, p. 5. N. p., 1947.

Griffin, John W. "Juan Ponce de Leon Began Florida Drama." *Florida Park Service News* for June, 1947. Tallahassee.

Griffin, John W. "A Summary of Florida Archeology." *Congressional Record*, Vol. 90, No. 143, pp. A4033–5. Washington, 1947.

Hassler, E. F. "Rock Shelter Explorations." TA, Vol. 3, No. 3, pp. 42–3. 1947.

Lewis, Thomas M. N., and Madeline Kneberg. *The Archaic Horizon in Western Tennessee*, Knoxville, 1947.

Lodge, Beth and R. L. "An Island Burial." TA, Vol. 3, No. 2, pp. 24–6. 1947.

Nash, Charles H. "An Archaeological Survey in the Dale Hollow and Center Hill Dam Areas." TA, Vol. 3, No. 3, pp. 44–5. 1947.

Pickle, R. W. "Regarding Some Interesting Artifacts." TA, Vol. 3, No. 2, pp. 22–3. 1947.

Quimby George I. "Life in the Deep South Centuries before the First White Men Arrived." CNHM-B, Vol. 18, No. 4, pp. 1–2. 1947.

Rights, Douglas L. *The American Indian in North Carolina*. Durham, N. C.: Duke University Press, 1947.

Smith, Hale G. "The Extension of History through Archaeology." *Florida Park Service News* for September, 1947. Tallahassee.

Stack, Guy. "A Preliminary Report on the Bozarth Site." TA, Vol. 3, No. 4, pp. 51–3. 1947.

Tatum, Robert M. "The Importance of Petroglyphs in Tennessee." TA, Vol. 3, No. 3, pp. 28–9. 1947.

Webb, William S., and William G. Haag. "Archaic Sites in McLean County, Kentucky." UKRA, Vol. 7, No. 1. 1947.

Webb, William S., and William G. Haag. "The Fisher Site, Fayette County, Kentucky." UKRA, Vol. 7, No. 2. 1947.

Ziemke, Paul C. "The Indian Sign Language." TA, Vol. 3, No. 3, pp. 30–1. 1947.

MIDDLE AMERICA

Aguilar P., Carlos H. "La orfebrería en el México precortesiano." *Acta Antropologica*, Vol. 2, No. 2. 139 pp., 29 pls. México, 1946.

Anderson, Edgar. "Maize in Mexico: a Preliminary Survey." MBG-A, Vol. 33, pp. 147–247. 1946.

Angel Fernández, Miguel. "Los adoritorios de la isla de Jaina." RMEA, Vol. 8, Nos. 1–3, pp. 243–60. México, 1946.

Anonymous. "An Amazing Discovery in the Field of Mayan Archaeology [Bonampak]." *Illustrated London News*, Vol. 211, No. 5651, pp. 141–3. London, 1947.

Anonymous. *Bonampak*, 5 pp., 1 pl. Boston and Washington, 1947.

Anonymous. "The Bonampak Expedition." EP, Vol. 54, No. 4, pp. 98–9. 1947.

Anonymous. "Crónica oficial de la Sociedad de Antropología y Arqueología de Honduras." HM, Año 1, No. 1, pp. 82–3. 1946.

Anonymous. "Del modo con que las antiguos Yucatecas computaban el tiempo." T, Año 6, No. 5, pp. 23–4. 1946.

Anonymous. "Excavations—Guatemala [Discovery of a Maya Site near Nebaj in the North Highlands]." *Pallas: International Art and Archaeology News Bulletin*, Vol. 12, pp. 140–1. Geneva, Switzerland, 1947.

Anonymous. "La flor del maíz." HM, Año 1. No. 1, p. 2. 1946.

Anonymous. "Green Priest." *Time Magazine*, Vol. 49. No. 25, p. 46. New York, 1947.

Anonymous. "Honduras Maya." HM, Vol. 1, No. 1, p. 1. 1946.

Anonymous. "Jungle Gods." *Time Magazine*, Vol. 49, No. 21, pp. 81–2. New York, 1947.

Anonymous. "New Find at Zaculeu (Guatemala)." EP, Vol. 54, No. 6, p. 151. 1947.

Armillas, Pedro. "Mexiquito, gran cuidad arqueológica en la cuenca del Rio de Las Balsas." EMA, Vol. 6, Nos. 7, 8, pp. 261–2. 1944.

Armillas, Pedro. "Los Olmeca—Xicalanca y los sitios arqueológicos del

suroeste de Tlaxcala." RMEA, Vol. 8, Nos. 1–3, pp. 1–9, 137–46. 4 figs. 1946.

Armillas, Pedro. "La serpiente emplumada: Quetzalcoatl y Tlaloc." CA, Vol. 31, No. 1, pp. 161–78. 1947.

Barlow, R. H. "Coatlicamac." Tl, Vol. 2, No. 2, pp. 190–1. 1946.

Barlow, R. H. "The Codex of the Derrumbe del Templo Mayor." CIW-NMAAE, No. 72. 1946.

Barlow, R. H. "The Codex of Tonayan." CIW-NMAAE, No. 84, pp. 178–87. 1947.

Barlow, R. H. "Materiales para una cronología del Imperio de los Mexica." RMEA, Vol. 8, Nos. 1–3, pp. 207–15. México, 1947.

Barlow, R. H. "Some Examples of Yeatla-Naranjo Geometric Ware." CIW-NMAAE, No. 73. 1947.

Barlow, R. H. "Stone Objects from Cocula and Chilacachapa, Guerrero." CIW-NMAAE, No. 80. 1947.

Barlow, R. H. "The 'Tortuga' of Coatlan del Río, Morelos." CIW-NMAAE, No. 76. 1947.

Berlin, Heinrich, and Silvia Rendon, editors. "Historia Tolteca-Chichimeca. Anales de Quauhtinchan." *Fuentes para la Historia de México*, colección publicada bajo la dirección de Salvador Toscano, Vol. 1. México, 1947.

Bourgeois, Julia F. "Los verdaderos años del calendario Azteca y Maya y el verdadero sistema cronológico Maya." SGH-A, Vol. 21, No. 1, pp. 3–17. 1946.

Brainerd, George W. "Another Falsified Maya Codex." Mas, Vol. 22, No. 1, pp. 17–18. 1948.

Brainerd, George W. "A Pottery Figurine Head from Tres Zapotes, Vera Cruz, Mexico." Mas, Vol. 21, No. 4, pp. 127–30. 2 figs. 1947.

Bullock, Irwin. "Mexico and Central America." *Art of Ancient America*, No. 17. 8 pp., 8 figs., 1 map. London, 1947.

Burland, C. A. "A 360-Day Count in a Mexican Codex." M, Art. 114, pp. 106–8. 1947.

Caso, Alfons. *Calendario y escritura de las antiguas culturas de Monte Albán*. 102 pp., 19 pls., 69 figs. México, 1947.

Caso, Alfonso. "El calendario matlatzinca." RMEA, Vol. 8, Nos. 1–3, pp. 95–109. 1946.

Caso, Alfonso. "Resumen del informe de las exploraciones en Oaxaca, durante la 7a y la 8a temporadas." *Vigesimo-Septimo Congreso Internacional de Americanistas, Actas de la Primera Sesión*, Vol. 2, pp. 159–87. México, 1947.

Chávez Orozco, Louis, editor. *Codice Osuna*. 342 pp. México, 1947.

Cook, S. F. "Human Sacrifice and Warfare as Factors in the Demography of Pre-Colonial Mexico." *Human Biology*, Vol. 18, No. 2, pp. 81–102. 1946.

Dimick, John M. *The Age of Zaculeu*. U.S.A., 1947.

Fidias Jiménez, Tomás. "El monolito de 'Casa Blanca,' Shiuteti o Kinich-Kakmo." T, Año 6, No. 5, pp. 9–22. 1946.

Freyle, Joan. "Hieroglyphs of Towns in Northern Morelia." Tl. Vol. 2, No. 2, pp. 182–4. 1946.

Fulton, Charles C. "Elements of Maya Arithmetic with Particular Attention to the Calendar." CIW-NMAAE, No. 85, pp. 188–201. 1947.

García del Palacio, Diego. "Carta sobre las ruinas de Copán (1576)." HM, Año 1, No. 1, pp. 66–7. 1946.

García Payón, José. "Los monumentos arqueológicos de Mainalco, Estado de México." RMEA, Vol. 8, Nos. 1–3, pp. 5–63. 1946.

García Payón, José. "Problémes archéologiques de la region Totonaque." SAP-J, Vol. 35, pp. 69–88. 2 pls. 1 chart, 1 table. 1947.

Gibson, Charles, 2nd. "Lewis Henry Morgan and the Aztec 'Monarchy.'" SJA, Vol. 3, No. 1, pp. 78–84. 1947.

Gilbert, Henry D. "Una nota sobre patología Maya." HM, Año 1, No. 1, pp. 66–7. 1946.

Girard, Rafael. "Copán y Copán Calel." HM, Año 1, No. 1, pp. 64–5. 1946.

Gruyter, W. Jos. de. *A New Approach to Maya Hieroglyphs*. 71 pp., 1 pl. Amsterdam, 1945.

Hagen, Victor Wolfgang von. *Maya Explorer: John Lloyd Stephens and the Lost Cities of Central America and Yucatan*. 324 pp. Norman, Okla., 1947.

Joest, Louis J. "Las ruinas de Copan: 'un viejo amor.'" HM, Año 1, No. 1, pp. 71–2. 1946.

Kelly, Isabel. "Excavations at Apatzingan, Michoacan." VFPA, No. 7. 1947.

Kidder, Alfred V. "La cerámica Ulúa-Yujos." HM, Año 1, No. 1, pp. 60–1. 1946.

Kidder, Alfred V.; Jesse D. Jennings; and Edwin M. Shook. "Excavations at Kaminaljuyu, Guatemala." With "Technological Notes" by Anna O. Shepard. CIW-P, No. 561. 1946.

Lister, Robert H. "Survey of Archaeological Remains in Northwestern Chihuahua." SJA, Vol. 2, No. 4, pp. 433–54. 1946.

Lizardi Ramón, César. "La civilización Maya de Morley." CA, Vol. 35, No. 4, pp. 197–206. 2 pls. 1947.

Longyear. J. M. III. "Cultures and People of the Southwestern Maya Frontier." *Carnegie Institution of Washington, Division of Historical Research, Theoretical Approaches to Problems*, No. 3, Cambridge, Mass., 1947.

Lunardi, Federico. "Una cabeza de judeita entre los Cares." HM, Año 1, No. 1. 78 pp., 2 figs. 1946.

Lunardi, Federico. "Hueitlapalan." HM, Año 1, No. 1, pp. 49–58. 1946.

Lunardi, Federico. "La majestad como insignia de poder entre los Mayas." HM, Año 1, No. 1. 80 pp. 1946.

Lunardi, Federico. "Miscélanea Maya." HM, Año 1, No. 1, pp. 75–7. 3 pls. 1946.

Lunardi, Federico. "Sesesmil, Sisimte y las cuevas legendarias en Honduras." HM, Año 1, No. 1, pp. 79–80. 1946.

Lunardi, Federico. "El sol duimo y nocturno de los Mayas." HM, Año 1, No. 1, pp. 3–40. 7 pls. 1946.

Lunardi, Federico. "Tres vasos mayas del valle de Comayagua." HM, Año 1, No. 1. p. 77. 1946.

Maldonado-Koerdel, Manuel. "Bibliografía Mexicana de prehistoria." BBAA, Vol. 9, pp. 66–71. 1947.

Mateos Higuera, Salvador. "Colección de estudios, sumarios de los códices pictóricos indígenas." Tl, Vol. 2, No. 2, pp. 175–9. 1946.

McAfee, Byron. "The Techialoyan Codices: Codex E [Codex of Cempoallan, Hidalgo]." Tl, Vol. 2, No. 2, pp. 141–9. 1946.

McAfee, Byron, and R. H. Barlow. "The Techialoyan Codices: Codex K [Codex of Santa María Calacohuayan]. Tl, Vol. 2, No. 2, pp. 184–5. 1946.

McAfee, Byron, and R. H. Barlow. "The Titles of Tetziotzinio [Santa María Nativitas]." Tl. Vol. 2, No. 2, pp. 110–27. 1 pl. 1946.

Moldano Koer, Hugo. "Jaina: un cementario Maya." RMEA, Vol. 8, Nos. 1–3, pp. 217–42. 1946.

Neys, Horace, and Hasso V. Winning. "The Treble Scroll Symbol in the Teotihuacan and Zapotec Cultures." CIW-NMAAE, No. 74. 1946.

Núnez, Ch. Jesús. "Ruinas de Copán." HM, Año 1, No. 1, pp. 62–3. 1946.

Pijoan, José. *Summa Artis. Historia general del arte: Vol. X, Arte precolombino, Méxicano y Maya*. 610 pp., 23 pls., 933 figs. Espasa-Calpe, 1946.

Pozo, Elfrén C. del. "Pharmacological Studies of Some Plants used in Aztec Medicine." AI, Vol. 6, No. 4, pp. 351–65. 1946.

Proskouriakoff, Tatiana. "An Album of Maya Architecture." CIW-P, No. 558. 144 pp. 1946.

Proskouriakoff, Tatiana, and J. E. S. Thompson. "Maya Calendar Round Dates such as 9 Ahau 17 Mol." CIW-NMAAE, No. 79. 1947.

Rendón, Silvia. "El Quauhtemalacatl." SGH-A, Vol. 21, No. 1, pp. 50–6. 1946.

Roys, R. L. "The Book of Chilam Balam of Ixil." CIW-NMAAE, No. 75. 1946.

Rubín de la Borbolla, Daniel F. "Arqueología del sur de Durango." RMEA, Vol. 8, Nos. 1–3, pp. 111–20. México, 1946.

Satterthwaite, Linton, Jr. "Concepts and Structures of Maya Calendrical Arithmetics." *Joint Publications of the Museum of the University of Pennsylvania and the Philadelphia Anthropological Society*, No. 3. Philadelphia, 1947.

Satterthwaite, Linton, Jr., "A Stratified Sequence of Maya Temples." *Journal of the Society of Architectural Historians*, Vol. 5, pp. 15–21. 1945–46.

Schuls, R. P. C. "Los sistemas cronológicos de los libros del Chilam Balam." EMA, Vol. 6, Nos. 7 and 8, pp. 239–60. 1944.

Smith, R. E. "Un vaso de marmol de Ulúa encontrado en Uaxactun." HM, Año 1, No. 1, pp. 61–2. 1946.

Stallings, W. S., Jr. "The Precolumbian Pottery of Western Mexico." SL, Vol. 8, No. 2, p. 22. 1947.

Stirling, Matthew W. "On the Trail of La Venta Man." NGM, Vol. 91, No. 2, pp. 137–72. 1947.

Stone, Doris, "Indians and Costa Rica." *Bulletin of the Pan American Union*, Vol. 82, No. 2, pp. 61–9. Washington, 1947.

Stone, Doris. "La posición de los Chorotegas en la arqueología Centroamericana." RMEA, Vol. 8, Nos. 1–3, pp. 121–31. 1946.

Stone, Doris. "Rasgas y demarcaciones del complejo maya en Honduras." HM, Año 1, No. 1, pp. 67–9. 1946.

Stromsvik, Gustavo. "Confines conocido de la Maya clásica de Copán." HM, Año 1, No. 1, pp. 69–70. 1946.

Stromsvik, Gustavo. *Guide Book to the Ruins of Copan*. 76 pp. Cambridge, 1947.

Tejeda, Antonio, "Drawings of Tajumulco Sculptures." CIW-NMAAE, No. 77, pp. 107–21. 1946.

Thompson, J. Eric. "Mexican Round Table." EP, Vol. 53, No. 12, pp. 355–6. 1946.

Vellard, J. A. "Estudios de algunos conscriptos indígenas de Honduras." HM, Año, 1, No. 1, pp. 74–5. 1946.

Villagra Caleti, Augustín. "Las Pinturas de Bonompak." CA, Vol. 34, No. 4, pp. 151–69. 3 pls, 8 figs. 1947.

Winning, Hasso V. "Certain Types of Stamped Decoration on Pottery from the Valley of Mexico." CIW-NMAAE, No 86. 1947.

Winning, Hasso V. "Representations of Temple Buildings as Decorative Patterns on Teotihuacan Pottery and Figurines." CIW-NMAAE, No. 83, pp. 170–7. 1947.

SOUTH AMERICA

Anderson, Edgar. "A Variety of Maize from the Río Loa." MBG-A, Vol. 30, pp. 469–71. 9143.

Anonymous. "Death of Julio Tello." EP, Vol. 54, No. 7, p. 173. 1947.

Anonymous. "Nota: el Doctor Gerardo Arrubia." BA, Vol. 1, No. 6, pp. 629–30. 1945.

Anonymous. "Peruvian Tomb Discovered." EP, Vol. 53, No. 12, pp. 349–50. 1946.

Anonymous. "Pre-Inca Markings in Peru: People of Nasca made Lines in the Desert to Plot Course of the Sun." *Life* Magazine, Vol. 23, No. 4, pp. 75–76, 78. 6 figs. 1947.

Anonymous. "Progress in Anthropology [Venezuela]." AI, Vol. 6, No. 4, pp. 377–9, 1946.

Anonymous. "Recent Additions to the Institute's Collection of Peruvian Pottery." *Bulletin of the Minneapolis Institute of Arts*, Vol. 36, No. 1, pp. 1–7. Minneapolis, 1947.

Anonymous. "Talegas Atacameñas." *Revista del Museo Histórico Nacional de Chile*, Año 1, No. 4, p. 503. Santiago, 1945.

Aubourg, Michel. "Les recherches archéologique de M. Herbert Krieger dans le Nord." BERH-B, Vol. 2, No. 3, pp. 41–9. 1947.

Becker, Hans. "Die Schmuckplatten der Calchaquí." *Archiv für Völkerkunde*, Vol. 1, pp. 164–88. Vienna, 1946.

Belli, Próspero L. "Un enigma prehistórico revelado [Peru]." SGH-A, Vol. 21, No. 1, pp. 22–8. 1946.

Belli, Próspero L. "Transcendental descubrimiento arqueológico Peruano." T. Año 6, No. 5, pp. 25–8. 1946.

Bennett, Wendell C. "Conference on Peruvian Archaeology." EP, Vol. 54, No. 9, pp. 213–16. 1947.

Bushnell, G. H. S. "South America." *Art of Ancient America*, No. 17. 8 pp., 11 figs., 1 map. London, 1947.

Collier, Donald. "Peruvian Archaeological Expedition returns: 1500 Years of History uncovered." CNHM-B ,Vol. 18, No. 2. 1947.

Cosculluela, J. A. "Sincronismo de las culturas Indo-Antillanas." RAE, Año 1, No. 3, pp. 27–51. 1946.

Cosculluela, J. A., and María Elena. Prehistoria documentada Cuba y Haití. CGG, No. 12, La Habana, 1947.

Cruxent, J. M. "Descubrimiento del primer cráneo con deformación internacional tabula-erecta en la zona del Tacarigua [Aragua, Venezuela]." *Boletín de la Sociedad Venezolana de Ciencias Naturales*, Vol. 10, No. 69, pp. 335–61. 12 figs. Caracas, 1947.

Cruxent, J. M. "Reconocimiento arqueológico en los alrededores de los saltos de Tacaqua, Dto. Federal, Venezuela." AV, Vol. 1, No. 4, pp. 393–408. 1946.

Cubillos Ch., Julio César. "Apuntes para el estudio de la cultura Pijao." Et, Vol. 11, No. 1, pp. 47–83. 1946.

Cubillos Ch., Julio César. "Arqueología de Rioblanco (Chaparral Tol.)." BA, Vol. 1, No. 6, pp. 519–30. 1945.

Duque Gómez, Louis. "Información antropológica de Colombia. 1946." BBAA, Vol. 9, pp. 8–14. 1947.

Dupouy, Walter. "Doctor Rafael Requena." AV, Vol. 1, No. 4, pp. 459–62. 1946.

Dupouy, Walter, and José M. Cruxent. "Reconocimiento arqueológico de El Topo de Tacagua, Distrito Federal, Venezuela." SCN-M, Vol. 6, No. 16, pp. 121–52. 1946.

Fisher, Kurt A. "La culture prehistorique d'Haiti (Ciboneys)." BERH-B, No. 2, pp. 22–6. 1947.

Francisco de Avila, P. "Origen y costumbres de los antiguos Huaranchiri." IEA-A, Vol. 7, pp. 225–60. 1946.

García Castañeda, J. A. "Los ocupantes precolombinos del término de Holguín." *Notas del Museo García Feria*, No. 4. Holguín, Cuba, 1946.

Gatto, Santiago. "Exploraciones arqueológicas en el pucará de Volcán." MLP-R, Vol. 4, No. 18, pp. 5–91. 21 pls., 58 figs. 1946.

Ginés, Hno.; Fr. Cayetano de Carrocera; J. M. Cruxent; and Jesús M. Risquez. "Manicuare." SCN-M, Vol. 6, No. 16, pp. 157–200. 1946.

González Muñoz, Antonio, and Igancio Avello. "Asiento Cantabria: descubrimiento del residuario de cultura alferara más occidental de Cuba." RAE, Año 1, No. 3, pp. 11–27. 1946.

González Simo, Blanca. "Frank Edward Johnson, un arqueólogo Norteamericano en Cuba." RAE, Año 1, No. 3, pp. 52–5. 1946.

Herrera Fritot, René. "Tres notas para la arqueologiá indo cubana." CGG, No. 5. Habana, 1945.

Herrera Fritot, René, and Charles Leroy Youmans. *La Caleta, joya arqueológica antillana*. Habana, 1946.

Howard, George D. "Prehistoric Ceramic Styles of Lowland South America, their Distribution and History." YUPA, No. 37. 1947.

Larco Hoyle, Rafael. "La escritura Peruana pre-Inca. (El original sistema ideográfico fué empleado por todos los antiguos Peruanos. Nuevas pruebas y analogías con la escritura Maya.)" EMA, Vol. 7, Nos. 7 and 8, pp. 219–38, 14 pls. 1944.

Lehmann, Henri. "Statuette en or de type 'Agustinien.'" SAP-J, Vol. 35, pp. 89–90. 1947.

Leicht, H. *Indianische Kunst und Kultur: ein Jahrtausend im Reiche der Chimu*. 352 pp., 116 illus., 36 drawings, 3 maps. Zurich: Orell Füsli Verlag, 1944.

Lopez Ramírez, Tulio. "Actividades antropológicas en Venezuela: 1946." BBAA, Vol. 9, pp. 48–51. 1947.

McBryde, Felix Webster. "Cultural and Historical Geography of Southwest Guatemala." SI-ISA, No. 4. 184 pp., 47 pls., 2 figs., 25 maps. Washington, 1947.

Margain, Carlos R. "Mesa redonda de arqueología Peruana [Chiclín, Trujillo, 1946]." BBAA, Vol. 9, pp. 43–8. 2 tables. 1947.

Márquez, Juan Luis. "Arqueólogico puertorriqueño realiza con exito excavaciones en Luquillo." *Puerto Rico Ilustrado* for July 19, 1947, pp. 5–15. San Juan.

Márquez Miranda, Fernando. "Los Diaguitas: inventario patrimonial arqueológico y paleo-etnográfico." *Revista del Museo de la Plata*, Nueva Serie, Vol. 3, pp. 5–300. La Plata, 1946.

Meggers, Betty J. "The Beal-Steere Collection of Pottery from Marajo Island, Brazil." MASAL-P, Vol. 31, pp. 192–213. 1947.

Miguel Alonso, Orencio. "Fases constructivas del hacha petaloide." RAE, Año 1, No. 3, pp. 5–10. 1946.

Morales Patiño, Oswaldo. "La mítica Indoantillana del tabaco." CGG, No. 6. 1945.

Morales Patiño, Oswaldo, and Roberto Pérez de Acevado. "El período de transculturación Indo-Hispánica." CGG, No. 4, 1945.

Morales Patiño, Oswaldo. "La rebeldía de los Indocubanos." *Revista Bimestre Cubana*, Vol. 56, No. 2, pp. 97–134. Habana, 1945.

Muelle, Jorge C. "Actividades antropológicas en Péru: 1946." BBAA, Vol. 9, pp. 41–2. 1947.

Newmann, Marshall T. "Indian Skeletal Material from the Central Coast of Peru." With a "Synopsis of the Archaeology" by Gordon R. Willey. PM-P, Vol. 27, No. 4, 71 pp., 7 pls., 26 tables, 1 map. 1947.

Nimo, Fr. Agustín F. *Arqueolo ta de Laguna Honda (Yucat, Provincia de Córdoba)*. Córdoba: Universidad de Nacional Córdoba, 1946.

Obregón, Gonzalo J. "Arquitectura Peruana." CA, Vol. 34, No. 4, pp. 276–80. 4 pls. 1947.

Oliva, Manuel G. "Contribución al estudio de la arqueología del norte de la Provincia de Córdoba. Los paraderos de Pozo de la Ollas y Laguna de la Sol." *Publicaciones del Instituto de Arqueología, Lingüística y Folklore "Dr. Pablo Cabrera," Universidad Nacional de Córdoba*, No. 16. 28 pp., 20 figs. Argentina, 1947.

Osten, Erimar von der. "Las pictografías de Cueva Pintada." AV, Vol. 1, No. 4, pp. 409–15. 1946.

Pérez de Acevado, Roberto. "Las 'esferas liticas' e informe al Primer Congres Nacional de Geografía." *Instituto Cubano de Arqueología*, Vol. 1, Nos. 1–2. Habana, 1947.

Perrier, A. "Histoire des pyramides de Quito." SAP-J, Vol. 35, pp. 91–122. 1 pl. 1947.

Pichardo Moya, Felipe. "Los indios de Cuba en sus tiempos históricos." *Publicaciones de la Academia de la Historia de Cuba*, No. 170. Habana, 1945.

Quevado A., Sergio A. "La trepanación Incana en la región del Cusco." T, Año 5, No. 6, pp. 59–108. 1946.

Recaseus, Josep de. "Las esculturas de Piedra Blanda de 'La Belleza'." *Revista del Instituto Etnológico Nacional*, Vol. 2, No. 1, pp. 117–52. 9 pls., 3 figs., 1 map, 2 charts and tables. Bogotá, 1945.

Reichlen, Henry and Paule. "Contribution á l'archéologie de la Guayane Française." SAP-J, Vol. 35, pp. 1–24. 2 pls., 5 figs., 1 map. 1947.

Requena, Rafael. "Los Cerritos." AV, Vol. 1, No. 4, pp. 388–92. 1946.

Rex González, Alberto. "Investigaciones arqueológicas en las nacientes del Paraná Pavón." *Publicaciones del Instituto de Arqueología, Lingüística y Folklore "Dr. Pablo Cabrera," Universidad Nacional de Córdoba*, No. 17. 4 pp., 8 pls., 9 figs. Argentina, 1947.

Roig de Leuchsenring, Emilio. "Legislación sobre arqueología aborigen, arqueología colonial, declaraciones de monumentos nacionales y etnología." RAE, Año 1, No. 2, pp. 5–74. 1946.

Rouse, Irving. "Ciboney Artifacts from Ile à Vache, Haiti." BERH-B, Nos. 2, 3, pp. 16–21, 61–6. 1947.

Rouse, Irving. "Prehistory of Trinidad in Relation to Adjacent Areas." M, Vol. 47, Art. 103, pp. 93–8. 1 pl. 1947.

Rouse, Irving. "Sobre la cerámica de Barrancas." AV, Vol. 1, No. 4, pp. 463–5. 1946.

Royo Guardia, Fernando. "Exploración arqueológica en Jibacoa, Provincia de la Habana." CGG, No. 7. 1946.

Royo Guardia, Fernando. "Exploración arqueológica en Jibacoa, Provincia de la Habana." *Memorias de la Sociedad Cubana de Historia Natural "Felipe Poey,"* Vol. 18, No. 1, pp. 81–96, Pls. 5–8. Habana, 1946.

Rydén, Stig. *Archeological Researches in the Highlands of Bolivia*. 559 pp., 2 pls., 245 figs., 75 maps. Göteborg, 1947.

Schaden, Egon. "Curt Nimuendajú." IEA-A, Vol. 7, pp. 193–5. 1946.

Silva Celis, Eliecer. "Investigaciones arqueológicas en Sogamoso (continuación)." BA, Vol. 1, No. 6, pp. 467–90. 1945.

Silva Celis, Eliecer. "Relación preliminar de las investigaciones arqueológicas realizadas en 'La Belleza,' Santander." Et, Vol. 11, No. 1, pp. 531–51. 1945.

Silva Celis, Eliecer. "Sobre antropología Chibcha." BA, Vol. 1, No. 6, pp. 531–51. 1945.

Strong, William Duncan. "Archaeological Exploration in the Viru Valley, Peru by the Columbia University Expedition of 1946." ASNJ-NL, No. 16, pp. 13–14. 1947.

Strong, William Duncan. "Finding the Tomb of a Warrior-God." NGM for April, 1947, pp. 453–82.

Wagner, Emilio R. "Los trabajos de arqueología comparada en Santiago del Estero, Argentina: sus resultados." BBAA, Vol. 9, pp. 64–6. 1947.

Weibel, Adele Conlin. "Peruvian Earplugs." *Bulletin of the Detroit Institute of Arts*, Vol. 26, No. 1, pp. 22–3. Detroit, 1947.

Willey, Gordon. "The Viru Valley Program in Northern Peru." AcAm, Vol. 4, No. 4, pp. 224–38. 1946.

EARLY MAN

Anonymous. "Early Man in Mexico." EP, Vol. 54, No. 5, pp. 124–5. 1947.

Arellano, A. R. V. "El elefante fósil de Tepexpan y el hombre primitivo." RMEA, Vol. 8, Nos. 1–3, pp. 89–94. 1946.

Ashley Montagu, M. F. "Comments on Weidenreich's Paper concerning the Origin of Homo Sapiens." AA, Vol. 49, No. 4, pp. 686–9. 1947.

Comas, Juan. "Origen y evolución del hombre." *Biblioteca Enciclopédica Popular*, No. 159. México, 1947.

Eisley, Loren C. "The Fire and the Fauna." AA, Vol. 49, No. 4, pp. 678–80. 1947.

Harrington, Mark Raymond. "An Ancient Site at Borax Lake, California." *Southwest Museum Papers*, No. 16. Los Angeles, 1948.

Martínez del Río, Pablo. "El hombre fósil de Tepexpan." CA, Vol. 35, No. 4, pp. 139–50. 7 figs. 1947.

Mullerried, Frederico K. G. "Acerca del descubrimiento del 'Hombre de Tepexpan' (valle de México)." BBAA, Vol. 9, pp. 60–4. 1947.

Schultz, C. Bertrand, and W. D. Frankforter. "The Geologic History of the Bison in the Great Plains." *Bulletin of the University of Nebraska State Museum*, Vol. 3, No. 1. Lincoln, 1946.

Sellards, E. H., Glenn L. Evans, Grayson E. Meade, and Alex D. Krieger. "Fossil Bison and Associated Artifacts from Plainview, Texas," *Bulletin of the Geological Society of America*, Vol. 58, pp. 927–54. Baltimore, 1947.

Simpson, Ruth D. "Missouri Mysteries." Mas, Vol. 21, No. 6, pp. 199–201. 1947.

Skinner, Morris F., and Ove C. Kaisen. "The Fossil *Bison* of Alaska and Preliminary Revision of the Genus." *Bulletin of the American Museum of Natural History*, Vol. 89, pp. 127–256. New York, 1947.

Storni, Julio S. "El hombre Tukma (*Hortus tucumanensis*)." *Publicación, Universidad Nacional de Tucumán*, No. 407. Tucumán, 1946.

Taylor, Jay L. B. "Again: the 'Mastodon Bone.'" AA, Vol. 49, No. 4, pp. 689–95. 3 figs. 1947.

Terra, Helmut de. "Discovery of an Upper Pleistocene Human Skeleton at Tepexpan, Valley of Mexico." S, Vol. 105, No. 2732, pp. 493–4. 1947.

Terra, Helmut de. "The Fossil Man of Tepexpan." RMEA, Vol. 8, Nos. 1–3, pp. 287–8. 1946.

Terra, Helmut de. "New Evidence for the Antiquity of Early Man in Mexico." RMEA, Vol. 8, Nos. 1–3, pp. 69–88. 1946.

Weidenreich, Franz. "Facts and Speculations concerning the Origin of Homo Sapiens." AA, Vol. 49, No. 2, pp. 187–203. 1947.

INDEX OF VOLUME XIII

Alaska: A Unique Specimen of Pressure-Flaked Pyrite from St. Lawrence Island, 181.

Albuquerque Meeting of the Society for American Archaeology, 347.

Annual Meeting of the Society for American Archaeology, 1947, 193.

Appointments by the President, 191.

Approach to the Mayan Correlation Problem through Guatemala Highland Archaeology and Native Annals, 59.

Archaeological Reconnaissance in Tamaulipas, Mexico, 33.

Archaeological Sites in the Middle Río Balsas Basin, 192.

Archaeological Theory and Anthropological Fact, 128.

Archaeological Zone of Buena Vista, Huaxcama, San Luis Potosí, Mexico, 15.

Archaeology of the Middle Río Balsas Basin, Mexico, 67.

Arctic: News of, 267.

Art: Line Drawings from Unsatisfactory Photographs, 323; Pictographs from Tramping Lake, Manitoba, 180; Preservation of the Kuaua Mural Painting, 218.

Artifacts: A Unique Specimen of Pressure-Flaked Pyrite from St. Lawrence Island, Alaska, 181; Further Information on Projectile Points from Oregon, 177; A Large Pre-Columbian Copper Bell from the Southwest, 80; Note on an *Apocynum* Fabric, 179; Stone Eating Utensils of Prehistoric New England, 146; West Indian Ax from Florida, 323; Yuma Point from Western Idaho, 251.

Astronomical Test of Caso's Correlation, 323.

Barlow, Robert H., Review, Historia Tolteca-Chichimeca: Anales de Quauhtinchan, 265; Review, Historia Tolteca-Chichimeca: Liber in Lingua Nahuatl, 265; Review, Die Mexikanische Bilder-handschrift Historia Tolteca Chichimeca, 265.

Beads of Meteoric Iron from an Indian Mound near Havana, Illinois, 302.

Bell, Robert E., Review, Tree Ring Analysis, Problems of Dating: II, the Tusayan Ruin, 259.

Bennett, Wendell C., Review, Tiahuanacu, The Cradle of American Man, 336.

Berlin, Heinrich, Review, Resumen del informe de las exploraciones en Oaxaca, durante la 7a y la 8a temporadas 1937–1938 y 1938–1939, 340.

Blair, William, Crania from the Warren Mounds and their Possible Significance to Northern Periphery Archaeology, 142.

Bliss, Wesley L., Preservation of the Kuaua Mural Paintings, 218.

Brazil: Ciudad Real: a Guaraní-Spanish Site on the Alto Paraná River, 163.

Bullen, Adelaide K., Archaeological Theory and Anthropological Fact, 128.

Burial Traits of the Headwaters Lakes Aspect in Manitoba, 109.

Burials: Burial Traits of the Headwaters Lakes Aspect in Manitoba, 109; Remarks on the Prone Burial Position in China and North America, 249.

Calendar: An Approach to the Maya Correlation Problem through Guatemala Highland Archaeology and Native Annals, 59; A Note on the Maya Venus Table, 82; Yucatecan Chronological Systems, 53.

California: The Quantitative Investigation of Aboriginal Sites: Comparative Physical and Chemical Analysis of Two California Indian Mounds, 135; The Quantitative Investigation of Aboriginal Sites: Complete Excavation with Physical and Archaeological Analysis of a Single Mound, 287.

Caywood, Louis R., Yuma Point from Western Idaho, 251.

Ceramic Sequence in the Etowah Drainage, Northwest Georgia, 201.

Champe, John L., Review, The Upper Missouri River Valley Culture in North Dakota, 261.

Ciudad Real: a Guaraní-Spanish Site on the Alto Paraná River, 163.

Clear Fork Focus, 97.

Comments on a Site in the St. Marks National Refuge, Wakulla County, Florida, 182.

Constitution and By-Laws of the Society for American Archaeology, 198.

Cook, S. F., The Interrelation of Population, Food Supply, and Building in Pre-Conquest Central Mexico, 45; The Quantitative Investigation of Aboriginal Sites: Comparative Physical and Chemical Analysis of Two California Indian Mounds, 135; The Quantitative Investigation of Aboriginal Sites: Complete Excavation with Physical and Archaeological Analysis of a Single Mound, 287.

Crania from the Warren Mounds and their Possible Significance to Northern Periphery Archaeology, 142.

Cressman, L. S., Further Information on Projectile Points from Oregon, 177.

Cultural Affiliations and Chronological Position of the Clear Fork Focus, 97.

Cultural Context of the Crystal River Negative Painted Style, 325.

Culture Sequence in the Manatee Region of West Florida, 209.

Du Solier, Wilfrido, The Archaeological Zone of Buena Vista, Huaxcama, San Luis Potosí, Mexico, 15.

Early Man: Facts Concerning the Clear Fork Culture, 320; Further Information on Projectile Points from Oregon, 177; News of, 279; Preliminary Note on the Discovery of Fossil Man at Tepexpan in the Valley of Mexico, 40; Yuma Point from Western Idaho, 251.

Ecuadorean Figurines and the Ceramic Mold in the New World, 85.

Editorial Council, 192.

Enger, Walter D., Jr., Crania from the Warren Mounds and Their Possible Significance to Northern Periphery Archaeology, 142.

Eskimo Stone House Ruins on the East Side of Hudson Bay: a Correction, 250.

Evidence of Pre-Pottery Cultures in Louisiana, 227.

Facts Concerning the Clear Fork Culture, 320.
FENTON, WILLIAM N., Review, The New World, 189.
Fifth Plains Conference for Archaeology, 347.
Figurines: Ecuadorean Figurines and the Ceramic Mold in the New World, 85.
FISHER, REGINALD B., Obituary, Edgar Lee Hewett, 78.
Florida: Comments on a Site in the St. Marks National Refuge, Wakulla County, Florida, 182; The Cultural Context of the Crystal River Negative Painted Style, 325; Culture Sequence in the Manatee Region of West Florida, 209; a Preliminary Definition of Archaeological Areas and Periods in Florida, 114; Prototype for the Southern Cult, 328; Two Historical Archaeological Periods in Florida, 313; West Indian Ax from Florida, 323.
FOWLER, WILLIAM S., Stone Eating Utensils of Prehistoric New England, 146.
Further Information on Projectile Points from Oregon, 177.
Georgia: The Ceramic Sequence in the Etowah Drainage, 201.
GJESSING, GUTORM, Some Problems in Northeastern Archaeology, 298.
GOGGIN, JOHN M., A Preliminary Definition of Archaeological Areas and Periods in Florida, 114; Review, Papers of the Michigan Academy of Science, Arts, and Letters, Vol. 31, 336; West Indian Ax from Florida, 323.
GREENMAN, EMERSON W., Review, Chippewa Village, The Story of Katikegon, 334.
GRIFFIN, JAMES B., Review, An Album of Maya Architecture, 263; The Archaeological Zone of Buena Vista, Huaxcama, San Luis Potosí, Mexico, 15; Review, Preliminary Report on the Upper Mississippi Phase in Wisconsin, 189.
GRIFFIN, JOHN W., Comments on a Site in the St. Marks National Refuge, Wakulla County, Florida, 182.
GROGAN, ROBERT M., Beads of Meteoric Iron from an Indian Mound near Havana, Illinois, 302.
Guaraní: Ciudad Real: A Guaraní-Spanish Site on the Alto Paraná River, 163.
HARRINGTON, J. C., Plain Stamped, Shell Tempered Pottery from North Carolina, 251.
HAURY, EMIL W., A Large Pre-Columbian Copper Bell from the Southwest, 80.
Headwaters Lakes Aspect: Burial Traits of, 109.
HEIZER, ROBERT J., Remarks on the Prone Burial Position in China and North America, 249.
HEWETT, EDGAR L., Obituary of, 78.
HIBBARD, CLAUDE W., Review, The Fossil Bison of Alaska and Preliminary Revision of the Genus, 335.
Honduras: A Sub-Pottery Deposit at Copan, Honduras, 248.
Hopewellian Burial Site in the Lower Republican Valley, Kansas, 306.
Hudson Bay: Eskimo Stone House Ruins on the East Side of Hudson Bay, a Correction, 250.
HUGHES, JACK T., An Archaeological Reconnaissance in Tamaulipas, Mexico, 33.
Idaho: Yuma Point from Western Idaho, 251.
Illinois: Beads of Meteoric Iron from an Indian Mound near Havana, Illinois, 302; The Pre-Pottery Faulkner Site of Southern Illinois, 232.
Interrelation of Population. Food Supply, and Building in Pre-Conquest Central Mexico, 45.
IVES, RONALD L., Line Drawings from Unsatisfactory Photographs, 323.
Kansas: A Hopewellian Burial Site in the Lower Republican Valley, Kansas, 306.
KELLEY, J. CHARLES, The Cultural Affiliations and Chronological Position of the Clear Fork Focus, 97.
KIDDER, A. V., Review, Mexico South, the Isthmus of Tehuantepec, 342.
KRIEGER, ALEX D., The Archaeological Zone of Buena Vista, Huaxcama, San Luis Potosí, Mexico, 15.
Large Pre-Columbian Copper Bell from the Southwest, 80.
Line Drawings from Unsatisfactory Photographs, 323.
LINTON, RALPH, Review, Men out of Asia, 331.
LISTER, ROBERT, H., Archaeology of the Middle Río Balsas Basin, Mexico, 67.
LONGYEAR, JOHN M., III, A Sub-Pottery Deposit at Copan, Honduras, 248.
Louisiana: Evidences of Pre-Pottery Cultures in Louisiana, 227.
MACNEISH, RICHARD S., The Pre-Pottery Faulkner Site of Southern Illinois, 232; A Preliminary Report on Coastal Tamaulipas, Mexico, 1; Review, Angel Site, Vanderburgh County, Indiana, 88.
Manitoba: Burial Traits of the Headwaters Lakes Aspect in Manitoba, 109; Pictographs from Tramping Lake, Manitoba, 180.
MANNING, T. H., Eskimo Stone House Ruins on the East Side of Hudson Bay: a Correction, 250.
MANSON, CARL, Marcey Creek Site: an Early Manifestation in the Potomac Valley, 223.
Marcey Creek Site: an Early Manifestation in the Potomac Valley, 223.
Maya: An Approach to the Mayan Correlation Problem through Guatemala Highland Archaeology and Native Annals, 59; An Astronomical Test of Caso's Correlation, 323; A Note on the Maya Venus Table, 82.
Meetings of the Society: 192, 193, 347.
MERRILL, ROBERT H., A Note on the Maya Venus Table, 82; Review, Concepts and Structures of Maya Calendrical Arithmetics, 264.
MERRILL, ROBERT S., A Progress Report on the Dating of Archaeological Sites by Means of Radioactive Elements, 281.
Mexico: An Approach to the Mayan Correlation Problem through Guatemala Highland Archaeology and Native Annals, 59; An Archaeological Reconnaissance in Tamaulipas, Mexico, 33; Archaeological Sites in the Middle Río Balsas Basin, 192; The Archaeological Zone of Buena Vista, Huaxcama, San Luis Potosí, 15; Archaeology of the Middle Río Balsas Basin, Mexico, 67; An Astronomical Test of Caso's Correlation, 323; The Interrelation of Population, Food Supply, and Building in Pre-Conquest Central Mexico, 45; A Note on the Maya Venus Table, 82; Preliminary Note on the Discovery of Fossil Man at Tepexpan in the Valley of Mexico, 40; A Preliminary Report on Coastal Tamaulipas, Mexico, 1; Yucatecan Chronological Systems, 53.

Middle America: News of, 277.
NELSON, N. C., Obituary, CLARK WISSLER, 1870–1947, 244.
Nevada: Note on an *Apocynum* Fabric, 179.
New England: Stone Eating Utensils of Prehistoric New England, 146.
New Mexico: Preservation of the Kuaua Mural Paintings, 218.
Nominations for New Officers, 192.
North America: Remarks on the Prone Burial Position in China and North America, 249.
North Carolina: Plain Stamped, Shell Tempered Pottery from North Carolina, 251.
Northeast: News of, 95, 275; Some Problems in Northeastern Archaeology, 298
Northern Mississippi Valley: News of, 274, 93.
Note on an *Apocynum* Fabric, 179.
Note on the Maya Venus Table, 82.
Obituaries: Edgar Lee Hewett, 78; Clark Wissler 1870–1947, 244.
O'NEALE, LILA M., Note on an *Apocynum* Fabric, 179.
Oregon: Further Information on Projectile Points from, 177
Pacific Coast: News of, 91, 268.
Papers at the Albuquerque Meeting, 347.
Pictographs from Tramping Lake, Manitoba, 180.
Plain Stamped, Shell Tempered Pottery from North Carolina, 251.
Plains: Burial Traits of the Headwaters Lakes Aspect in Manitoba, 109.
Plains Archaeological Conference, 347.
POTOSKY, NORMAN and ROMAYNE L., A Unique Specimen of Pressure-Flaked Pyrite from St. Lawrence Island, Alaska, 181.
Pottery: The Ceramic Sequence in the Etowah Drainage, Northwest Georgia, 201; The Cultural Context of the Crystal River Negative Painted Style, 325; Ecuadorean Figurines and the Ceramic Mold in the New World, 85; Plain Stamped, Shell Tempered Pottery from North Carolina, 251.
Pre-Pottery Faulkner Site of Southern Illinois, 232.
Preliminary Definition of Archaeological Areas and Periods in Florida, 114.
Preliminary Note on the Discovery of Fossil Man at Tepexpan in the Valley of Mexico, 40.
Preliminary Report on Coastal Tamaulipas, Mexico, 1.
Preservation of the Kuaua Mural Paintings, 218.
Progress Report on the Dating of Archaeological Sites by Means of Radioactive Elements, 281.
Prototype for the Southern Cult, 328.
Quantitative Investigation of Aboriginal Sites: Comparative Physical and Chemical Analysis of Two California Indian Mounds, 135; Complete Excavation with Physical and Archaeological Analysis of a Single Mound, 287.
RAY, CYRUS N., The Facts Concerning the Clear Fork Culture, 320.
REED, ERIK K., Review, The Sinagua: a Summary of the Archaeology of the Region of Flagstaff, Arizona, 258.
Remarks on the Prone Burial Position in China and North America, 249.
Reviews: An Album of Maya Architecture, 263; Angel Site, Vanderburgh County, Indiana, 88; Archaeology of the High Western Plains, 262; Ash Hollow Cave, 87; Chippewa Village, The Story of Katikitegon, 334; Concepts and Structures of Maya Calendrical Arithmetics, 264; Contributions to American Anthropology and History, Vol. 8, 338; Dating the Past, an Introduction to Geochronology, 89; Excavations at Kaminaljuyu, Guatemala, 343; The Fossil Bison of Alaska and Preliminary Revision of the Genus, 335; Handbook of South American Indians, Vols. 1–2, 253; Historia Tolteca-Chichimeca Anales de Quauhtinchan, 265; Historia Tolteca Chichimeca: Liber in Lingua Nahuatl, 265; Indians Before Columbus, 184; Man in Northeastern North America, 332; Maya Explorer, John Lloyd Stephens and the Lost Cities of Central America and Yucatan, 337; Men out of Asia, 331; Mexico South, the Isthmus of Tehuantepec, 342; Die Mexikanische Bilderhand-schrift Historia Tolteca Chichimecas, 265; The New World, 189; Papers of the Michigan Academy of Science, Arts, and Letters, Vol. 31, 336; The Pleistocene Period, its Climate, Chron ology and Faunal Successions, 88; Preliminary Report on the Upper Mississippi Phase in Wisconsin, 189; Resumen del informe de las exploraciones in Oaxaca, durante la 7a y 8a temporadas 1937–1938 y 1938–1939, 340; The Sinagua: A Summary of the Archaeology of the Region of Flagstaff, Arizona, 258; a Stratified Prehistoric Site at Brewerton, New York, 89; Tiahuanacu, The Cradle of American Man, 336; Tree Ring Analysis, Problems of Dating: II, the Tusayan Ruin, 259; the Upper Missouri River Valley Culture in North Dakota, 261.
ROUSE IRVING, West Indian Ax from Florida, 323.
RUPPERT KARL, Review, Maya Explorer, John Lloyd Stephens and the Lost Cities of Central America and Yucatan, 337.
RYDÉN, STYG, Review, Handbook of South American Indians, Vols. 1–2, 253.
SATTERTHWAITE, LINTON, Review, Contributions to American Anthropology and History, Vol. 8, 338.
SCHULTZ, FLOYD, A Hopewellian Burial Site in the Lower Republican Valley, Kansas, 306.
SEARS, PAUL B., Review, Dating the Past, an Introduction to Geochronology, 88; Review, The Pleistocene Period, its Climate, Chronology and Faunal Successions, 88.
SMITH, HALE G., Two Historical Archaeological Periods in Florida, 313.
Some Problems in Northeastern Archaeology, 298.
Some Recent Publications, 350.
South America: Ecuadorean Figurines and the Ceramic Mold in the New World, 85; News of, 96, 278.
Southeast, News of, 277.
Southern Cult: Prototype for the Southern Cult, 328.
Southwest: Crania from the Warren Mounds and their Possible Significance to Northern Periphery Archaeology, 142, a Large Pre-Columbian Copper Bell from the Southwest, 80; News of, 92, 270.
Southwestern Anthropological Association, 92.
Southwestern Archaeological Conference, 348.
SPAULDING, ALBERT C., A Hopewellian Burial Site in the Lower Republican Valley, Kansas, 306; Review, Archaeology of the High Western Plains, 262; Review, Ash Hollow Cave, 87.

Special Meeting at Albuquerque, 347.
STANTON, M. S., Pictographs from Tramping Lake, Manitoba, 180.
Stone Eating Utensils of Prehistoric New England, 146.
STRONG, WM. DUNCAN, Review, Indians Before Columbus, 184.
Sub-Pottery Deposit at Copan, Honduras, 248.
Summer Training Programs, 349.
Tepexpan Man, 40.
de Terra, Helmut, Preliminary Note on the Discovery of Fossil Man at Tepexpan in the Valley of Mexico, 40.
Texas: The Cultural Affiliations and Chronological Position of the Clear Fork Focus, 97; The Facts Concerning the Clear Fork Culture, 320.
TREGANZA, A. E., The Quantitative Investigation of Aboriginal Sites: Comparative Physical and Chemical Analysis of Two California Indian Mounds, 135; The Quantitative Investigation of Aboriginal Sites: Complete Excavation with Physical and Archaeological Analysis of a Single Mound, 287.
Two Historical Archaeological Periods in Florida, 313.
Unique Specimen of Pressure-Flaked Pyrite from St. Lawrence Island, Alaska, 181.
VICKERS, CHRIS, Burial Traits of the Headwaters Lakes Aspect in Manitoba, 109.
Virginia: Marcey Creek Site: An Early Manifestation in the Potomac Valley, 223.
WATSON, VIRGINIA DREW, Ciudad Real: A Guaraní-Spanish Site on the Alto Paraná River, 163.
WAUCHOPE, ROBERT, An Approach to the Mayan Correlation Problem through Guatemala Highland Archaeology and Native Annals, 59; The Ceramic Sequence in the Etowah Drainage, Northwest Georgia, 201; Review, Excavations at Kaminaljuyu, Guatemala, 343.
WEBB, C. H., Evidences of Pre-Pottery Cultures in Louisiana, 227.
West Indian Ax from Florida, 323.
WEITZEL, R. B., An Astronomical Test of Caso's Correlation, 323; Yucatecan Chronological Systems, 53.
WILLEY, GORDON R., The Cultural Context of the Crystal River Negative Painted Style, 325; Culture Sequence in the Manatee Region of West Florida, 209; Ecuadorean Figurines and the Ceramic Mold in the New World, 85; A Prototype for the Southern Cult, 328.
Wisconsin Archaeological Survey, 348.
WITTHOFT, JOHN, Review, Man in Northeastern North America, 332; Review, A Stratified Prehistoric Site at Brewerton, New York, 89.
Yucatecan Chronological Systems, 53.
Yuma Point from Western Idaho, 251.

MEMOIRS

of the

SOCIETY FOR AMERICAN ARCHAEOLOGY

The following numbers, if in print, may be obtained from the Treasurer, Glenn A. Black:

Number 1. *Big Bead Mesa: An Archaeological Study of Navaho Acculturation, 1745–1812.* By DOROTHY LOUISE KEUR. 90 pages, 4 plates, 5 figures. $1.00.

Number 2. *The Tchefuncte Culture, An Early Occupation of the Lower Mississippi Valley.* By JAMES A. FORD and GEORGE I. QUIMBY, JR., with an appendix on the Skeletal Remains by CHARLES E. SNOW. 113 pages, 12 plates, 23 figures, 3 folding tables. $1.50.

Number 3. *The Prehistory of Northern North America as Seen from the Yukon.* By FREDERICA DE LAGUNA. 360 pages, 30 plates, 33 figures. Out of print.

Number 4. *A Reappraisal of Peruvian Archaeology.* Assembled by WENDELL C. BENNETT. 128 pages, 72 figures. $1.50.

INFORMATION FOR AUTHORS

AMERICAN ANTIQUITY publishes original papers in the field of American Archaeology, as well as comments, reviews, and discussions on matters pertaining to this field. Articles on other regions, or on such related subjects as geography, history, and ethnography, may be accepted if of special significance to American Archaeology.

Accepted papers are published in the order of their receipt. Except for such papers as may be specially solicited, all papers bear the date of submission.

Manuscripts must be typewritten on standard 8½×11 inch paper, double spaced, and on one side of the page only. Bibliographies must follow a standard form. Citations from journals and series should be given as follows:

JENKS, ALBERT E., and LLOYD A. WILFORD
1938. "The Sauk Valley Skeleton." *Bulletin of the Texas Archaeological and Paleontological Society*, Vol. 10, pp. 136–68. Abilene.

Citations from separate books:

JENKS, ALBERT E.
1936. *Pleistocene Man in Minnesota.* Minneapolis: University of Minnesota Press.

Illustrations over and above two pages of halftones or the equivalent in line cuts and tables must be paid for by the author or the author's sponsor. Photographs for reproduction should be on a glossy paper, unmounted, and of a proportion suitable for reduction to 5¾×8⅝ inches or a portion thereof, making due allowance for captions. Line drawings should be in India ink on smooth, hardsurfaced paper, with figures written lightly in pencil on the margin or the back.

Galley proof, only, will be sent to authors, who will be charged for lengthy or unusual changes therein. Upon publication, manuscripts, illustrations, and engravings will be destroyed unless their return has been specifically requested.

Reprints without covers are supplied at the following prices, but only when ordered with returned, corrected galley proofs:

Copies	1–4 pp.	5–8 pp.	9–12 pp.	13–16 pp.	17–20 pp.	21–24 pp.	25–28 pp.	29–32 pp.
25	$2.50	$4.15	$ 6.15	$ 6.75	$ 8.65	$10.65	$11.90	$12.50
50	3.00	4.50	6.75	7.50	9.50	11.75	13.25	14.00
75	3.25	4.90	7.35	8.00	10.40	12.90	14.65	15.50
125	3.75	5.65	8.60	9.50	12.15	15.15	17.40	18.50
175	4.25	6.40	9.85	11.00	13.90	17.40	20.15	21.50
275	5.25	7.90	12.35	14.00	17.40	21.90	25.65	27.50

Covers with title and date of issue of AMERICAN ANTIQUITY will be furnished at the following rates: 25 for $2.50; additional covers 1½ cents each. Plates, printed 1 side, 100 for $2.00; printed 2 sides, 100 for $4.00.

TABLE OF CONTENTS

A Progress Report on the Dating of Archaeological Sites by Means of Radioactive Elements . . . . . Robert S. Merrill 281

The Quantitative Investigation of Aboriginal Sites: Complete Excavation with Physical and Archaeological Analysis of a Single Mound . . . A. E. Treganza and S. F. Cook 287

Some Problems in Northeastern Archaeology. . . . . Gutorm Gjessing 298

Beads of Meteoric Iron from an Indian Mound near Havana, Illinois . . . . . Robert M. Grogan 302

A Hopewellian Burial Site in the Lower Republican Valley, Kansas . . . . . Floyd Schultz and Albert C. Spaulding 306

Two Historical Archaeological Periods in Florida . . . . . Hale G. Smith 313

FACTS AND COMMENTS

The Facts Concerning the Clear Fork Culture . . . . . Cyrus N. Ray 320

Line Drawings from Unsatisfactory Photographs . . . . . Ronald L. Ives 323

An Astronomical Test of Caso's Correlation . . . . . R. B. Weitzel 323

A West Indian Ax from Florida . . . . . John M. Goggin and Irving Rouse 323

The Cultural Context of the Crystal River Negative-Painted Style Gordon R. Willey 325

A Prototype for the Southern Cult . . . . . Gordon R. Willey 328

BOOK REVIEWS

Gladwin: Men Out of Asia . . . . . Linton 331

Johnson: Man in Northeastern North America . . . . . Witthoft 332

Kinietz: Chippewa Village, the Story of Katikitegon . . . . . Greenman 334

Skinner and Kaisen: The Fossil *Bison* of Alaska and Preliminary Revision of the Genus . . . . . Hibbard 335

Papers of the Michigan Academy of Science, Arts, and Letters, Vol. 31 . . . Goggin 336

Posnansky: Tiahuanacu, the Cradle of American Man . . . . . Bennett 336

von Hagen: Maya Explorer, John Lloyd Stephens and the Lost Cities of Central America and Yucatan . . . . . Ruppert 337

Contributions to American Anthropology and History, Vol. 8 . . . . Satterthwaite 338

Caso: Resumen del informe de las exploraciones en Oaxaca, durante la 7a y la 8a temporadas 1937–1938 y 1938–1939. . . . . Berlin 340

Covarrubias: Mexico South, the Isthmus of Tehuantepec. . . . . Kidder 342

Kidder, Jennings, and Shook: Excavations at Kaminaljuyu, Guatemala . Wauchope 343

Notes and News 347

Some Recent Publications 350

Index of Volume XIII 357

AMERICAN ANTIQUITY IS INDEXED IN THE INTERNATIONAL INDEX

GEORGE BANTA PUBLISHING COMPANY, MENASHA, WISCONSIN